# The Chemical Age

**A Weekly Journal Devoted to Industrial and Engineering Chemistry**

VOL. XVI. No. 398 FEBRUARY 12, 1927 Prepaid Annual Subscription: United Kingdom, £1.1.0; Abroad, £1.6.0.

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*NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.*

*The prepaid subscription to* THE CHEMICAL AGE *is 21s. per annum for the United Kingdom, and 26s. abroad. Cheques, Money Orders and Postal Orders should be made payable to Benn Brothers, Ltd.*

*Editorial and General Offices: Bouverie House, 154, Fleet Street, London, E.C.4.*

Telegrams: "Allangas, Fleet, London." Telephone: City 0244

## Romance of Organic Chemistry

DR. E. F. ARMSTRONG'S lecture at the Royal Society of Arts on Wednesday evening, on "The Romance of the Organic Chemical Industry," was, as one would expect, a very compact and condensed review of modern developments. While everyone who heard the lecture must have felt that there was always the soundest chemistry behind it, it was largely an indication of the surprising industrial developments following upon the advance of chemical knowledge. Splitting up the historical progress of modern industry into periods, we come through the mechanical period, represented by such inventions as the steam engine, and the electrical period, represented by the perfection of electric light and power, to the chemical period, during which the needs of civilisation are increasingly met as the result of chemical discovery in the chemical factory, though, as Dr. Armstrong pointed out, chemical advances are only made in the closest association with the engineer and the physicist. It was no mere picturesque phrase to speak of the present period as the chemical, for even the layman is beginning to appreciate the wonderful industrial applications of laboratory discoveries.

Dr. Armstrong's lecture dealt mainly with the highly technical field of the alcohols, and in the simplest and clearest way he showed how laboratory curiosities of a few years ago have become the commonplaces of commerce to-day. Some interesting concrete examples of what has been achieved recently were shown in the shape of synthetic resins, strips of silk showing the multi-coloured effects produced by passing them through a film of colour on the surface of water, and what looked exactly like coloured beads, but were in reality the condensation products of urea and formaldehyde, attached in the most natural way to a delicate fabric. It was not, however, with the past only that Dr. Armstrong was concerned. Looking far ahead, he visualised an Empire linked together by roadless motor transport, dependent again on the chemist for the provision of synthetic fuels. As an example of exposition, Dr. Armstrong's talk was a masterpiece. One shudders to think of how many acres of formulæ and oceans of words the normal chemical expositor would have required to explain the processes by which the results had been obtained. Here, without a single formula and scarcely a technical term, always with the severest economy of words, the modern developments in organic chemistry were sketched in such a way that no one could help seeing and understanding them. It was a whole book, neatly compressed into an hour's easy talk; a contrast between the methods of the teacher who demonstrates his own cleverness by making things look difficult and the master who knows enough about them to make them look quite simple.

It was impossible that so sincere a scientist as the lecturer should miss the moral of what he had described, and once more we had an earnest plea for the necessity for the encouragement of research directed to finding out how to accomplish new things or even old things in a novel manner. It is not enough, Dr. Armstrong emphasised, to copy the achievements of the foreigner even if we should succeed in going further. Here success, both technical and commercial, is pretty certain from the start, and there is no real adventure after new truth. What is wanted is courage to undertake what is known as "long shot" or "blind shot" research often of a costly type with no certainty of results of commercial value. But if the risks are here, so also are the higher rewards, and the one cannot be obtained without incurring the other.

Two effective footnotes were added to the lecture by Mr. Chaston Chapman (who presided) and the lecturer's father, Professor H. E. Armstrong. The latter bluntly reminded us that brilliant as the results described were, the unpleasant truth was that they were based mainly on American work. The American employer was prepared to give the chemist plenty of rope and let him get on with his work; the deficiency

in this country was not scientific but commercial. There was a mildly dramatic touch in Professor Armstrong's reminder that many years ago he succeeded in getting a Society's grant of £50 to enable Cross to pursue his cellulose research; how many millions had resulted from that and similar work no one could say. Mr. Chaston Chapman opened up another chemical vista in reminding us of the processes of plant life and the way in which nature effects the most delicate synthesis without any resort of the high pressures and atmospheres, and other devices of the chemist or chemical engineer. The evening, on the whole, left one looking forward to new advances even more than back on the achievements of the recent past.

## The Edinburgh Meetings

THE programme of the annual meeting of the Society of Chemical Industry, to be held in Edinburgh during the week, July 4 to July 8, promises a pleasant blend of serious business and social engagements. The Society's office will be in the North British Station Hotel, most of the meetings in the University buildings, and the local honorary secretary is Dr. W. T. H. Williamson. On Monday, the opening day, there will be a reception by the Chairman of the Edinburgh Section, followed by a conversazione. The proceedings on Tuesday will include the council meeting, welcomes by the Lord Provost and the Vice-Chancellor, the annual business meeting, the presentation of the Society's medal to Lieut.-Col. Pollitt, the President's address, luncheon by the Edinburgh Section, an afternoon garden party, and an evening reception. Wednesday will be occupied with a joint meeting of the Biochemical Society and the Chemical Engineering Group on the subject of "Paper," a visit to the University laboratories and a University reception, and the annual dinner in the evening. On Thursday there will be a meeting of the Fuel Section on the subject of "Coal Cleaning," visits to James Brown and Co.'s paper mills and the North British Rubber works, and a civic reception. Friday, as usual, will be occupied with various excursions. In view of the attractions of the city and the interest of the programme, it is hoped that there will be a large attendance.

## The Position of By-Product Sulphate

AT the annual general meeting of the Gas Light and Coke Co. on Friday, February 4, the Governor, Sir David Milne Watson, in the course of his usual clear review of the situation made some unequivocal statements on the present position and future prospects of the by-product sulphate of ammonia industry. The company's revenue from by-product sulphate was less than in 1925, and Sir David ascribed this to the lower price now commanded by this product owing to the "over-production of nitrogen in the world." In the circumstances, there is a note of real public spirit in his subsequent remarks. The over-production of nitrogen is "a thing which may not suit the makers of sulphate, but which from the point of view of the agriculturist must be considered very satisfactory, as by the use of cheap fertilisers increased quantities of foodstuffs can be grown on a given space, a very desirable state of affairs in this densely populated world. That is the satisfaction, as citizens, we must derive from the lowering of sulphate prices, which are now much below those which were obtained even before the war." Sir David went on to say that he did not see any prospect of a change for the better in the position as regards prices of sulphate. Coming from such a source, this statement deserves notice. The proprietors of the Gas Light and Coke Co. may be inclined to feel somewhat sorrowful about the facts cited, but they probably consider that their loss of sulphate revenue is quite outweighed by the possession of a Governor who knows how to face facts, even when they are unpalatable ones.

## Government Chemical Deals

THE annual reports of the Select Committee of Public Accounts usually contain some spicy examples of departmental financial achievements, and those just issued do not disappoint expectations. There is an interesting account of a deal between two departments in which a trifling sum of £30,000 was lost. The first is a picric acid story, as told by the Committee:—"In July of 1923 a certain firm (Y. and Company) bought about 3,400,000 lb. of picric acid from the Disposals Board, at a price which was, roughly, ½d. per lb., after the service department had been consulted and said they did not want it. In 1925 the War Office put out tenders for about 150 tons of this stuff, and the lowest price offered for new material was 1s. 9d. per lb. Y. and Company offered some of this stuff which they had bought." A similar story deals with the sale and purchase of ferro-silicon, which is required for the production of hydrogen for airships. In 1924 the Air Ministry, without making any public tender, bought 100 tons of this commodity at £22 a ton, and, subsequently, 50 tons more at £20 14s. There is reason to believe (says the report) that the whole of the 150 tons formed part of the surplus stocks sold at £4 a ton by the Disposals Board in 1922, of which the purchasers had taken delivery shortly before these contracts were placed. These little mistakes on the part of our departmental rulers produce a kindly fellow-feeling; at the same time it is very unsafe to presume on the innocence of the civil servant. One may suddenly strike an unexpected store of ability.

## "British Chemicals"

"BRITISH CHEMICALS: their Manufacture and Uses," the official directory of the Association of British Chemical Manufacturers for 1927 (Ernest Benn, Ltd., pp. 286, 10s. 6d.), is the most authoritative handbook published on chemical products of British manufacture. The combined capital of the organisation it represents is stated to be £150,000,000, and its membership is entirely composed of *bona fide* British makers of chemical products. One of the objects of the Association is to promote and facilitate business relations between

manufacturing and chemical firms and purchasers throughout the world and to encourage legitimate international trade conditions. The directory is printed in English and five other languages, and it is intended for the use, not only of British commercial attachés, consular officers, and trade commissioners, but of the various Government purchasing departments throughout the world. Where intending purchasers have any difficulty in obtaining a particular article, they are advised to communicate with the Association, which will place the inquiry before all members likely to be in a position to execute the order in question. The Association assure inquirers of the "best expert and manufacturing opinion" on matters submitted to them. The 1927 edition, just out of the press, differs from earlier ones in that it contains information as to the uses of the various products mentioned in the classified list, and it is hoped that this feature will add to the usefulness of the volume. The information is arranged in convenient form for reference in three columns, which give the products in alphabetical order, their manufacturers, and their uses. In addition, there is a list of proprietary and trade names, with a description of their chemical character and list of manufacturers, and also a comprehensive index.

## Ephedrine Hydrochloride

WE have more than once of late drawn attention to the enterprise of British fine chemical manufacturers, and are glad to note from time to time new achievements in this direction. With reference to recent reports on the use of the alkaloid Ephedrine and its salts in the new method of treatment of asthma and, prophylactically, for low blood pressure in pneumonia, etc., it is interesting to hear that the British Drug Houses, Ltd., have been making this alkaloid in their laboratories for some months past. The process has now been transferred to a commercial scale, and the firm are manufacturing pure Ephedrine Hydrochloride from the Chinese plant Ma Huang (*Ephedra vulgaris*), which they themselves import. It will be of considerable interest to our readers to know that this salt of Ephedrine can now be obtained from the British Drug Houses in tablets for oral administration as well as in solution in ampoules for hypodermic use. A sample box we have received indicates the great care taken in the packing and marketing of the product down to the smallest detail—which is, however, what we might expect.

### Books Received

ELECTRO-ORGANIC CHEMISTRY. By C. J. Brockman. New York: John Wiley and Sons, Inc. London: Chapman and Hall, Ltd. Pp. 381. 25s.

THE BLUE BOOK. THE DIRECTORY AND HANDBOOK OF THE ELECTRICAL ENGINEERING AND ALLIED TRADES. London: Ernest Benn, Ltd. Pp. 1432. 25s.

BRITISH CHEMICALS: THEIR MANUFACTURERS AND USES. The Official Directory of the Association of British Chemical Manufacturers. London: Ernest Benn, Ltd. Pp. 286. 10s 6d.

SURFACE WATER SUPPLY OF CANADA. Water Resources Paper No. 48. Department of the Interior, Ottawa, Canada: F. A. Acland. London: The Canadian Building, Trafalgar Square. Pp. 168.

ADVERTISEMENT WRITING. By Gilbert Russell. London: Ernest Benn, Ltd. Pp. 248. 8s. 6d.

THE NEW ELECTRICITY ACT. By W. S. Kennedy. London: Ernest Benn, Ltd. Pp. 142. 6s.

## The Calendar

| Feb. | | |
|---|---|---|
| 14 | Sir John Cass Technical Institute: "Preparation of Fuel." Professor K. Neville Moss. 6 p.m. | Jewry Street, Aldgate, London. |
| 14 | Institute of Chemistry and Society of Chemical Industry (Edinburgh Sections): "The Use of the Microscope in Qualitative Analysis." B. D. W. Luff. 8 p.m. | 36, York Place, Edinburgh. |
| 14 | Institute of Chemistry (Manchester Section): "Electronic Theories of Valency in Organic Chemistry." Professor R. Robinson. | Manchester. |
| 14 | Institute of Chemistry (Leeds Section): "The Work of the Chemist in the Food Industry." B. G. McLellan. | Leeds. |
| 14 | University of Birmingham Chemical Society. Joint Discussion with the Physics Society. | University, Birmingham. |
| 14 | Institute of Metals (Scottish Section): "Notes on Aluminium Alloys." D. R. Tullis. 7.30 p.m. | 39, Elmbank Crescent, Glasgow. |
| 14 | Ceramic Society: "The Discoloration of Clays During Firing." J. Konarzewski and A. E. J. Vickers. "Researches on the Theory of Fine Grinding." Dr. G. Martin and others. 7.30 p.m. | Stoke-on-Trent. |
| 15 | Society of Chemical Industry (Glasgow Section). 7 p.m. | 39, Elmbank Crescent, Glasgow. |
| 15 | Hull Chemical and Engineering Society: "Air Conditioning, and Air Conditioning Plant." E. G. T. Hill. 7.45 p.m. | Grey Street, Park Street, Hull. |
| 16 | Society of Glass Technology. General discussion on "Silicate Analysis." 2.30 p.m. | University, Sheffield. |
| 17 | Society of Chemical Industry (Ottawa Section): "Dyeing of Cement and Concrete." Dr. L. F. Goodwin. | Ottawa. |
| 17 | Chemical Society: Ordinary Meeting. 8 p.m. | Burlington House, Piccadilly, London. |
| 18 | Society of Chemical Industry, Institute of Chemistry, and Institute of Metals. (South Wales Sections.) Joint dinner. 7 p.m. | Thomas' Café, High Street, Swansea. |
| 18 | Society of Dyers and Colourists (Manchester Section): "A Picture of the Structure of the Cotton Fibre as an Aid to the Interpretation of some Phenomena." F. P. Slater. 7 p.m. | 36, George Street, Manchester. |
| 18 | West Cumberland Society of Chemists and Engineers: "Physical Research in Industry." R. G. Lunnon. 7 p.m. | Workington. |
| 18 | Society of Dyers and Colourists (London Section): "Recent Developments in Celanese Coloration." G. H. Ellis. | London. |
| 19 | Staffordshire Iron and Steel Institute, Birmingham Metallurgical Society, Institute of Metals: "Blast Furnace Practice." R. P. Bethell. 7 p.m. | Girls' High School, Dudley. |
| 19 | British Association of Chemists (London Section): Annual Dinner. | London. |
| 22 | Royal Photographic Society (Scientific and Technical Group). 7 p.m. | 35, Russell Square, London. |
| 23 | Royal Society of Arts: "Insulin and its Manufacture." F. H. Carr. 8 p.m. | John Street, Adelphi, London. |
| 23 | Institute of Chemistry (Belfast Section): "Primitive Australia." Professor Gregg Wilson. 7.30 p.m. | Royal Belfast Academical Institution. |
| 23 | Electroplaters' and Depositors' Technical Society: 'Electro-deposition of Iron." T. Johnson. 8.15 p.m. | Northampton Polytechnic Institute, St. John Street, London, E.C.1. |
| 24 | Oil and Colour Chemists' Association: "Further Notes on the Behaviour of Phenolic Resins." A. A. Drummond. | 8, St. Martin's Place, Trafalgar Square, London. |
| 24 | Chemical Society: Anniversary Dinner. 7 p.m. | Hotel Victoria, Northumberland Avenue, London. |

# The Romance of the Organic Chemical Industry

By E. Frankland Armstrong, D.Sc., Ph.D., LL.D., F.R.S.

*Summary of an address delivered by Dr. Armstrong before the Royal Society of Arts on Wednesday evening, Mr. Chaston Chapman in the chair.*

THAT science, even chemical science, has its romantic side is a fact which needs no argument before an audience composed of fellows of the Society of Arts, but you will be more inclined perhaps to associate the chemical industry with the all-important, though prosaic, subject of balance sheets, dividends, pollution of the atmosphere, and other necessary evils of the factory. Yet, as I shall endeavour to show, there is very distinctly a romance being played in our industry.

If it is permissible to break the historical progress of modern industry into periods, it can be said that we have experienced in turn, a mechanical and then an electrical period, during which the inventions and their applications most beneficial to man have been contributed by these sciences in turn; one need only recall the invention of the steam engine and of electric light. We are beginning to experience a chemical period, during which the comfort of the individual will be largely advanced directly as the result of the application of chemical discovery in the chemical factory, though it is hardly necessary to add that the chemist can only make advances when working hand in hand with the engineer and the physicist.

The world as we know it contains certain crude or raw materials of little use to man as such but capable of being elaborated in the industries to produce the thousand and one things which we regard as indispensable to-day.

Let us consider some of these, selecting our examples solely from the point of view of the chemist and limiting the choice still further so as to confine it to organic materials, which, as you know, are those containing carbon atoms in their structure, and see what can be made from them. Obvious choices for our study are coal, petroleum, cellulose in its many forms—for example, wood, cotton and other fibres, and starch in the form of cereals. It is true that these particular materials form the basis, without much elaboration, of most important products, but we shall see how the chemist is able to elaborate from them products which but a generation ago were mainly laboratory curiosities, though to-day they are or are about to be produced in such quantities and at such price that they enter largely into the comfort of every citizen.

### Aliphatic Alcohols

The story of the colour industry, of the winning of synthetic dyes from coal tar, has been told so often that I propose rather to select this evening another example of chemical achievement and to discuss the alcohols—the "aliphatic alcohols," as the chemist terms them.

Alcohol itself, ethyl alcohol, requires no introduction. As a product of fermentation, its uses have come down to us through the ages described in prose and song; to-day it forms one of the most popular means of providing the national revenue. It is as a solvent that we consider it now, though, unfortunately, in use, the necessary restrictions imposed by the Customs and Excise will never let us forget its more conventional application. Alcohol is made by fermentation of grain, of potatoes, of molasses—all raw materials which are subject to the usual variations of the market but which have a minimum price as they are also of value as foodstuffs. For industrial application, the price of alcohol must be low. In the great distilleries of America, it is made from molasses, brought in tank steamers from the sugar-producing islands of the Pacific, which are pumped into the fermentation vats at the seaboard and a continuous process of fermentation and distillation carried on so as to reduce labour costs to a minimum. Quite cheap alcohol is thus available for the varnish, lacquer, and artificial leather industries, which use it as solvent either as such or in the form of ethyl acetate. But the largest single use to-day is said to be as an anti-freezing agent in the radiators of motor-cars, the denatured spirit being sold in cans in every garage for this purpose.

Even so, still cheaper alcohol is required, so that search is anxiously being made for a raw material which is not a foodstuff, such as wood. The economic conversion of cellulose, for example, sawdust, into fermentable sugar is one of the prime problems of chemical industry to-day—from time to time, our hopes are raised by news of its successful solution. For a time during the war, alcohol was made in Switzerland from aldehyde made from calcium carbide, manufactured with the cheap electric power available, but this process appears too costly to compete to-day. A possibility of the future is that alcohol will be made from ethylene should this become available in quality.

### Methyl and Butyl Alcohol

Methyl alcohol, the next most important alcohol in commerce, is one of the products of the wood distillation industry. Its price has been subject to wide market fluctuations, according to the laws of supply and demand and the general state of the wood distillation industry. As is well known, the chemist has accomplished recently the synthesis of methyl alcohol from carbon monoxide and hydrogen by passing the mixed gases under great pressure over a suitable catalyst at a high speed. In consequence, unlimited quantities of methyl alcohol are available, derived from coal or coke at a cost which is probably less than 20 per cent. of what it used to be. When new uses are found for the alcohol either as a motor fuel or as a solvent, the price to the consumer can be lowered to make such uses attractive. The discovery of the new process, starting from the cheapest of all basic raw materials, has made methyl alcohol one of the least expensive of organic products, and, in due course, the way is clear to cheaper formaldehyde, and, consequently, to cheaper indigo and synthetic resins with, perhaps, many new and far-reaching applications of formaldehyde, which, though it would be tempting to discuss here, would take us too far.

Butyl alcohol was for many years only a product of the laboratory until it was produced in quantity as an unwanted by-product in the manufacture of acetone by fermentation. Uses were sought for the butyl alcohol which accumulated in this way; finally, it was found that butyl acetate formed a nearly ideal solvent for nitrocellulose. The fermentation process was re-started on an industrial scale, this time with butyl alcohol as its aim, the proportion of acetone being restricted as much as possible. To-day, thousands of tons per annum are being manufactured from grain or rice, and sold at a price which, though high, is well within commercial practicability.

But the new fermentation method is being menaced before it is hardly established. The pressure process for methyl alcohol when suitably modified in a manner which has not yet been disclosed, can be made to yield butyl alcohol said to be just as satisfactory as the fermentation product for use as a nitrocellulose solvent.

There is yet another chemical process in sight, based on acetylene—that is, on carbide as raw material. Acetylene is converted into acetaldehyde in the manner to be described when dealing with acetic acid. From acetaldehyde, by a series of reactions involving condensation and reduction, the two-carbon chain compound is converted into one with four carbon atoms, again a butyl alcohol resulting, which is suitable for the lacquer maker. The process is understood to be in operation on a large scale on the Continent, and to have commenced in Canada; the reactions involved proceed smoothly, and give good yields of pure products. Assuming the cost of operation to be much the same in the three processes, the ultimate cost depends on the price of the three basic raw materials, viz., grain, the gases from coke, and carbide, this last depending largely on the cost of electric power. Obviously the advantages of one process over the other will differ in the various countries according to other conditions prevailing in the local heavy chemical industries.

### Alcohol from Petroleum

Yet another potential source of butyl alcohol is from petroleum. It is customary to-day to crack, that is, heat under pressure, a great deal of the crude oil produced so as to convert it into fractions suitable for use as motor spirit. During cracking, considerable quantities of gas are produced, which, as a rule, are burnt in the cracking furnaces. Under certain conditions of cracking in the vapour phase, the gases contain ethylene, propylene, butylene, and similar hydrocarbons, and by absorbing these in sulphuric acid and subsequent hydrolysis and separation by distillation, the appropriate alcohols are obtained. Details of this process are not yet

well known, but it is already established on a commercial scale in America and isopropyl alcohol is being manufactured in quantity and shipped in tank cars which makes it of utility as a competitive solvent. In England, this alcohol is being manufactured in increasing quantities by a process involving catalytic reduction of acetone.

Butyl alcohol, undoubtedly, will be manufactured by the cracking process, though it has yet to be determined whether the product won in this manner has the same utility in the varnish industry as the fermentation product. I may remind you that even in so simple a product as butyl alcohol, containing four carbon atoms $C_4H_{10}O$, there are several ways of arranging the atoms so as to give different isomeric butyl alcohols :

$CH_3.CH_2.CH_2.CH_2OH$—normal boiling at..... 117°

$\begin{matrix}CH_3\\CH_3\end{matrix}\!\!>\!CH.CH_2.CH_2OH$—iso boiling at ..... 107°

$\begin{matrix}C_2H_5\\CH_3\end{matrix}\!\!>\!CH.OH$—ethylmethyl carbinol ..... 101°

$(CH_3)_3.C.OH$—trimethyl carbinol ..... 83°

In practice, fermentation gives the normal alcohol, pressure methods the iso alcohol, and cracking a mixture of secondary and tertiary alcohols. From aldehyde, the normal alcohol is obtained. Obviously, the difference in the boiling points will effect the utility of the isomerides.

The next higher alcohol is amyl alcohol, produced in a crude form as fusel oil to a limited extent in the distillery. A synthetic substitute will undoubtedly be produced by the pressure process—another is said to be made from prentane obtained from natural gas.

Our examination at some length of these alcohols shows that the chemist has gone a long way to replace the older methods of producing them by fermentation from substances which can also be used as foodstuffs by methods based on coal or on carbide, i.e., electric power from water, or on petroleum, as raw materials. They thus can be produced in any desired quantity and at prices which bring them within the reach of wide industrial application.

### Nitrocellulose Lacquers

Such application is as solvents in the manufacture of lacquers both for wood and metal, the use of which is spreading rapidly in every direction and bidding fair to oust the older methods of paint protection. The advance in part is also due to the protection of a low viscosity nitrocellulose, enabling the maker to market a product containing a large percentage of solids. The lacquers consist of nitrocellulose, a resin, and a pigment dissolved in an organic liquid, together with a diluent, plasticiser, and softener. Visitors to the motor show will be fully aware of the results, in particular the finish, obtained with lacquers of this type.

The solvents have to be satisfactory both for the nitrocellulose and the resin ; they should evaporate fast at first and slowly at the end. Those used are mixtures classified as low (boiling below 100° C.), medium (boiling about 125° C.), and high (boiling at 150°–200° C.), boilers and plasticisers and softeners (boiling near 300° C.).

### Acetic Acid

The alcohols whose production we have considered are used mainly as acetates, or, to some extent, as lactates and tartrates. Hence the production of acetic acid must also be taken within our survey. For many years, most of that used in commerce was obtained by the destructive distillation of wood. The crude grey acetate of lime was exported to Europe and decomposed with sulphuric acid, the crude acetic acid produced being purified by fractionation.

The alternative source was vinegar produced by fermentation. Usually a crude vinegar containing 10 to 12 per cent. of acetic acid is first made from potato spirit ; this is neutralised with lime, evaporated, and the calcium acetate decomposed. A new French process involving Young's principles of distillation enables the 10 per cent. solution to be concentrated in a still and obviates neutralisation. The quantity obtained in this way, mostly made from the refuse of the forests of Canada and the United States, did not suffice for the war requirements, and consequently, alternative processes were evolved on a manufacturing scale. These involve the oxidation of acetaldehyde, prepared either from acetylene by the use of a mercury catalyst—

$$CH{:}CH + H_2O = CH_3.CHO$$

or from alcohol dehydrogenated in presence of a copper catalyst—

$$CH_3C.H_2.OH = CH_3CHO + H_2$$

The former process was in use in Germany during the war, and has been studied in particular in Canada and brought to a stage of great perfection by the Canadian Electro-Products Co., who manufacture acetic acid by it in large quantities. The alcohol process was worked successfully in England during the war, no carbide being available ; its chance as a competitive process depends on the cost of the alcohol.

In the second stage of acetic acid manufacture, the aldehyde is oxidised by oxygen under slight pressure in presence of a catalyst such as manganese acetate—

$$2CH_3.CHO + O_2 = 2CH_3.CO_2H.$$

The cost of acetic acid is thus brought into direct relation with that of electric power, which, in such districts as Shawinigan, is very low. The wood distillation industry, which has to cover its costs either by the sale of acetic acid or methyl alcohol, now finds both products menaced, and can only exist on the sufferance of its more successful competitors.

The conversion of the alcohols into esters is a simple process, though this in its turn has been simplified and cheapened by the elaboration of continuous processes.

However, progress continues and ethyl acetate, even when made from fermentation alcohol and carbide acetic acid, is menaced now by ethyl acetate made direct from acetaldehyde by condensation in presence of aluminium ethoxide—

$$2CH_3.CHO = CH_3.CO_2C_2H_5$$

If this process proves a success chemically, its economic prospects appear to be considerable.

Just as the prospect of cheap formaldehyde appears to lead far in many organic syntheses, the possession of cheap acetaldehyde bristles with possibilities. The addition to it of hydrogen cyanide, and subsequent hydrolysis, would result in a synthesis of lactic acid—

$$CH_3.CHO + HCN = CH_3.CH(OH).CN$$

which is at present somewhat laboriously made by a fermentation process. It is understood that this method is under study.

### Phthalic Acid

I have time for one other illustration, the production of phthalic acid, the esters of which are of prime importance as plasticisers. Until a few years back, phthalic acid was essentially a scientific curiosity, and its technical application unthought of. It was then discovered how to make it easily and at a surprisingly low cost by the catalytic oxidation of naphthalene, one of the commonest constituents of coal tar, with air. At once, phthalic acid became a raw material for some of the most striking syntheses in the dye industry, namely, those of the anthraquinone or so-called vat dyes, which are the fastest colours known, and, consequently, becoming every day of greater importance. Other uses were sought for it and found, one in the lacquer industry, and another as the basis of an artificial resin of altogether exceptional electrical properties. The investigators of the purely scientific problem of the behaviour of vanadium as a catalyst for oxidation reactions have been rapidly rewarded by the development of industry based on their discovery.

### "New Routes for Old"

Enough perhaps has been said to show what progress is being made in purely chemical industries to render large amounts of material available to create new industries for the greater comfort of man. Lacquers, artificial leather, new fuels, new dyes, resins, all result from the comparatively few substances we have studied in some detail to-night, and we have left untouched such fields as artificial silk and synthetic nitrogenous fertilisers.

If there is a moral, it is the never ending necessity for the encouragement of research, research directed to finding how to accomplish new things, or even old things in a novel manner. "New routes for old" must be the cry of the Aladdin of 1927. It is not enough to copy in this country the achievements of the foreigner, even if in so doing we can go further—new work must be encouraged even at considerable cost irrespective of any question whether it will yield immediate financial return.

# Detonation in Engines Using Liquid Fuel

## Results of Recent Research

*As briefly announced last week, important research has recently been undertaken by the Air Ministry Laboratory at the Imperial College of Science under the direction of Captain R. O. King, into the fundamental cause of "knocking" in engines using liquid fuel. The following report on "Dopes and Detonation" is published by permission of the Director of Scientific Research to the Air Ministry.*

THE investigations forming the basis of this report were undertaken with the assistance of the staff of the Air Ministry Laboratory by request of the Director of Scientific Research, Air Ministry.

The primary object of the investigation was to complete a rational explanation of the cause of detonation in engines using liquid fuel, with especial reference to the chemical side of the problem; the physical and thermodynamical aspect having been dealt with in a previous report, R. and M. 1013, on "The Nuclear Theory of Detonation."

The investigation has included an experimental and theoretical study of low temperature oxidation of liquid fuels in air, in conjunction with engine experiments to determine the relationship between detonation and observed chemical action.

It is found that detonation in an engine using liquid fuel is due to the formation of organic peroxides, which become concentrated in the nuclear drops during compression and ignite them simultaneously when the detonation temperature of the peroxide is reached.

It is suggested that the isolation of organic peroxides and a study of their properties might lead to the discovery of more useful dopes than are known at present or possibly to new methods of preventing detonation.

This report forms a continuation of the previous report on the same subject submitted to the Director of Scientific Research, November, 1925, which has been published by the Aeronautical Research Committee in their Reports and Memoranda No. 1013. In that report a nuclear theory of detonation was developed, founded on the thermodynamical and physical properties of paraffin fuels under the conditions prevailing in the cylinder of a high compression engine. It was shown that residual drops, consisting chiefly of the higher paraffins, would tend to persist in the charge during compression and in the portion of the charge remaining unburnt at any moment after ignition. These nuclear drops, on account of their low ignition temperature, would act as foci of simultaneous inflammation giving rise to detonation, though they form a very small percentage of the whole mixture.

The effectiveness of the metallic dopes, lead ethide and iron or nickel carbonyl, was explained by the fact that they naturally become concentrated in the nuclear drops, where they decompose, depositing metal, which tends to delay the oxidation of the drops. The low ignition temperature of liquid drops of the higher paraffins was accepted as an experimental fact, but it was anticipated that further light might be obtained when the chemical side of the problem had been adequately explored.

It was pointed out, however, that the conditions existing at the surface of a liquid drop during rapid compression would be exceptionally favourable to absorption and chemical action, as compared with those existing in a completely vaporised and uniform mixture. Each drop would be surrounded by a graded atmosphere of progressive mixture strength. The richest layer close to the surface of the drop, being nearly pure vapour, would tend to recondense as the pressure increased, carrying with it any products of incipient oxidation, which may be formed, in the case of paraffins, at temperatures far below the ignition temperature as usually defined (R. and M. 1013). It is also evident that the mixture strength most favourable to low temperature combustion would be found somewhere in the variable zone surrounding each nuclear drop, and that the surface of the nuclear drops would be most advantageously situated for accumulation of condensible products of incipient oxidation such as may occur during rapid compression. The higher the compression ratio the greater the probability of the occurrence of nuclear drops at the beginning of compression owing to the low initial temperature, and the greater the likelihood of their persistence in the unburnt portion of the mixture towards the end of the ignition on account of the greater rapidity of the rise of pressure. Accordingly, in the light of the nuclear theory, it seemed probable that an explanation of the difference between various fuels in respect of detonation should be sought in a study of the chemical reactions which were likely to occur at temperatures existing during compression before the ignition point was reached. As the pressure conditions were difficult to reproduce, it was decided in the first instance to study the chemical reactions occurring at atmospheric pressure in various mixtures during slow or incipient combustion without inflammation. The method adopted for investigating the products of low temperature oxidation is fully described and figured in the section giving details of experiments. Some of the principal results are here summarised to make the programme of work more intelligible. Briefly, the method consisted in passing the mixture slowly through a glass tube in an electric furnace maintained at the desired temperature and analysing the products obtained in each case.

The temperature of incipient oxidation in the case of detonating fuels, such as the paraffins, was found to be far below the ignition temperature, and to be variable with mixture strength, the lowest temperatures being found with mixtures more than twice as rich as could be used in an engine. There was a general parallelism between the oxidation temperature and the ignition temperature, but in the case of non-detonating fuels, such as benzene, the oxidation temperatures appeared to be higher than reputed values of the ignition temperature, and varied but slightly with mixture strength.

Of the intermediate products of oxidation of the paraffins the *aldehydes* were far the most important, reaching 70 per cent. in the case of hexane. In the case of non-detonating fuels, such as benzene and alcohol, the aldehyde yield was very small and occurred only at much higher temperatures.

In the case of the paraffins, the first appearance of the aldehydes at low temperatures was accompanied by a certain proportion of $CO_2$ and $H_2O$. This led to the conclusion that the aldehydes themselves were decomposition products of some prior compound formed by the direct union of oxygen with the molecule of the fuel. This conclusion received a striking confirmation in the discovery that the addition of a dope, such as lead ethide, or iron carbonyl, to a paraffin mixture undergoing slow combustion, had the effect of almost entirely preventing the normal formation of aldehydes, reducing the yield in the case of hexane from 72 per cent. to 10 per cent. at 500° C. and to a mere trace at lower temperatures.

It appeared from the experiments that the dopes did not act by destroying the aldehydes after they were formed, but by preventing their formation. That is to say the dopes must take effect directly on the primary compound of which the aldehydes are products of decomposition of a relatively stable character.

The primary compound formed by the direct union of oxygen with the fuel molecule would probably be of a very unstable character and difficult to detect under the conditions of these experiments at atmospheric pressure, although it might be able to persist in solution in the nuclear drops at higher pressures during compression in the engine. According to Bone's hypothesis, which is generally accepted, the primary compounds formed during slow oxidation should be hydroxyl compounds. This did not appear to meet the case, (1) because no hydroxyl compounds could be detected in the products, (2) because their formation would require the disruption of the oxygen molecule, which appeared very unlikely at such low temperatures. Any disruption of the oxygen molecule into atoms could hardly fail to be accompanied by a profuse generation of the electric ions, which could easily be detected. This experiment was tried by inserting a pair of electrodes in the experimental tube during aldehyde formation, but no trace of ionisation could be detected until the temperature was raised to the point of

inflammation, when the intense ionisation which always accompanies flame was immediately apparent.

The suppression of the aldehydes could not be regarded in itself as a satisfactory chemical explanation of the action of dopes, because the aldehydes were comparatively inert and stable bodies without appreciable effect in suppressing or inducing detonation.

The solution of the chemical problem was reached by Dr. Mardles, who argued that the addition of a complete oxygen molecule without disruption should result in the formation of alkyl *peroxides*, which would naturally give rise to aldehydes and water as decomposition products. The test for peroxides in the products of slow oxidation was immediately successful in the case of all detonating fuels, including ether. On the other hand, non-detonating fuels, such as benzene and alcohol, showed little or no trace of peroxide formation. Some of these peroxides, such as acetyl peroxide, discovered by Brodie, 1864, are known to detonate violently when heated. Others such as benzoyl peroxide are comparatively inert. But all appear to act as detonation inducers.

Tests of peroxides as dopes in the variable compression engine, showed them to possess very marked detonation inducing qualities, when added to common fuels. Production of peroxides in the engine itself, under motoring conditions without any spark, has also been demonstrated, although the time available for their formation is very short, and the temperatures much lower than those which occur when the engine is firing. The amount of peroxide produced in such a case would of course be far too small to give rise to detonation by itself. But it sufficed in the case of undecane at the highest compression ratio to cause simultaneous self-ignition of the nuclear drops. It has not yet been possible to isolate these particular peroxides in quantity, but it is expected that useful results may be obtained by the investigation of their properties in solutions sufficiently dilute to be free from serious risk.

Many comparative experiments on slow oxidation were made with two or more combustion tubes side by side in the furnace under the same conditions. When one tube was traversed by a very fine spray, and the other by a completely vaporised mixture, it was found that peroxides were formed in great profusion in the liquid drops, while the vaporised mixture showed very little effect. The peroxides present in the drops caused ignition by intermittent flashes at a much lower temperature than that required to ignite the vaporised mixture, which burnt with a steady flame when the temperature was sufficiently raised. Each flash is presumably started by the ignition of the peroxides accumulated in the drops and is followed by a brief period of quiescence during which the concentration of the peroxides increases till it suffices to start another flash. When a metallic dope was added to the spray, the profuse formation of peroxides in the drops could no longer be detected. The addition of the dope also completely stopped the intermittent flashing, thus presenting a close analogue to the suppression of detonation in the engine.

In the previous report, R. and M. 1013, the experiments with the E. 35 engine were relegated to a separate section. In the present research, the engine experiments were so closely related to those on low temperature combustion, that it appeared desirable to describe the results of both sets in logical order. The detailed reports of the separate investigations have accordingly been digested and combined in a continuous summary made in collaboration with Captain R. O. King, who was mainly responsible for the direction and co-ordination of the work.

### Inquest on Hendon Explosion Victim

THE inquest on the body of Walter Jarrett, 46, the victim of the explosion which occurred on Monday, January 31, at the Hendon Chemical Works, Renters Avenue, Hendon, occupied by Johnson and Sons, Ltd., of Cross Street, Finsbury, was opened on Thursday, February 3. Francis Bellamy stated that Jarrett was his brother-in law, and had been engaged in the chemical works for many years. He once had an accident. Jarrett was in the habit of smoking. The Coroner said it would be some time before the other men, injured at the same time, would be able to give evidence, and the inquest was adjourned until March 17.

## Oil from Coal

### Dr. Lander's Review of Fuel Research

DR. C. H. LANDER, Director of Fuel Research, read a paper on "The Production of Oil from Coal" and gave an account of the Fuel Research Station to the Institution of Petroleum Technologists at the house of the Royal Society of Arts, John Street, Adelphi, on Tuesday.

If the present lines of development, he said, in the use of oil fuel were to continue it was obvious that at some time or other in the world's history oil would have to be obtained in large quantities from other than natural sources, and, in view of the unfavourable position in regard to natural oil, it was important that Great Britain should be ahead of the whole world in the development of processes for the production of manufactured oil from fuel resources which existed in the country. The process of development could only take place gradually and would be profoundly affected by the existence of large quantities of natural oil in other countries.

Manufactured oil could be obtained from coal by a variety of processes, and such processes might be divided into two distinct categories according to whether they yielded oil as the main product or as a by-product. It was obvious in the former case that unless the oil could be made at a phenomenally cheap rate undertakings would always be subjected to such disabilities as had reacted from time to time in the shale oil industry, which had always been at the mercy of waves of depression coinciding with waves of increased activity and increased production of natural oilfields. Processes, on the other hand, in which oil was obtained as a by-product were in a more favourable position, provided that they could be so worked that the profits on the main products were sufficiently great to mask the variations in price which must occur from time to time in oil.

#### Commercial Carbonisation

In the development of any commercial process of carbonisation it was generally necessary that four distinct stages should be passed through. First, the suggested method must be investigated under laboratory conditions where the varying factors involved could be subjected to close control and where relatively high accuracy of measurement could be obtained. Secondly, the process was carried a stage further by erecting an intermediate scale unit, with a view to obtaining further designing data for a still larger unit. In this stage the plant would probably deal with several hundredweights a day. Thirdly, making use of the information yielded in the second stage, a full-scale unit must be erected and tried out. The size of this unit would depend on the type of plant, but might range between, say, 5 tons and 100 tons daily capacity. It was essential that this unit should be capable of multiplication to the full size of commercial unit without any alteration in scale. Fourthly, a commercial battery consisting of several units similar to those developed in the third stage would be erected in some favourable locality and the economic possibilities of the system examined in actual practice, and, if necessary, tested by actual commercial audit.

In the past much damage had been done to the cause of low-temperature carbonisation by the omission of either the third or fourth stages, and plants of large size had been put up without a proper recognition of the factors involved, so that failure was almost inevitable. The Fuel Research Station was erected and equipped with the definite object of carrying investigations of fuel treatment through all the necessary preliminary steps to success in the third stage: their subsequent economic success or failure could only be decided in conjunction with industry.

After a brief summary of the mechanical resources of the research station Dr. Lander described the working and development of various retorts and said that the consensus of opinion of those who had inspected them was that they were distinctly promising and appeared to be reaching the end of the third stage. Should this conclusion be confirmed by further close tests with freshly-mined coal, steps would be taken to have a small commercial setting tried out in some suitable locality in order to investigate thoroughly its economic possibilities, and so to carry the investigations to their final stage, when their success or failure could be judged by actual commercial audit.

# Reviews

PHOTOSYNTHESIS. By H. A. Spoehr. American Chemical Society Monographs. New York: The Chemical Catalog Co., Inc. Pp. 392. $6.50. To A.C.S. Members: $5.85.

In the comparatively limited space of less than four hundred pages Spoehr has succeeded in presenting a most fascinating digest of the botany, chemistry, and physics of photosynthesis as applied to the carbon assimilation of the green plant, which is a remarkable achievement in itself. However, the value of the book lies not only in the manner in which it has been compiled but also in the fact that Spoehr himself has contributed a great deal of experimental work on the subject and that some of his methods, which have either been described in journals not easily accessible in this country, or so far not described at all, have now become general property. Spoehr's technique seems to be remarkable for its simplicity, and the apparatus devised by him (compare for example the illustration of the Spoehr chamber on p. 250) bears witness to his ingenuity and experimental skill.

Like all other books on photosynthesis Spoehr's monograph leaves one with the same impression, namely, that we know nothing definite whatever of the mechanism which underlies the conversion of carbon dioxide into carbohydrates as performed by the living plant. This is surprising considering the simplicity of the reaction: $xCO_2+xH_2O=[CH_2O]_x+xO_2$, by which photosynthesis is generally represented and the certainty with which the solution of the question has been announced from time to time. Probably the simplicity of the reaction has been the undoing of the apparently successful workers, whose results are, however, not confirmed either by Spoehr, by Vorländer (*Ber.*, 1925, 58, 2656), not mentioned by Spoehr, and by many other workers on photosynthesis whose results are described in the book under review.

The work is divided into seven chapters, all of which are separate monographs in themselves. They are excellently written, with the exception of the last chapter (pp. 338–383), which deals mainly with the chemistry of chlorophyll and which scarcely does credit to the greatness of Willstätter's work on chlorophyll. Spoehr seems to have missed some of the salient points in Willstätter's arguments which he sometimes spoils by wrong formulæ (compare for example p. 362). Incidentally it might be mentioned that the structural formula for phytol, one of the components of chlorophyll, given on p. 358, was withdrawn by Willstätter soon after it was proposed by him, and it therefore should not have been included in the monograph as representing the constitution of phytol.

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THE PROBLEM OF PHYSICO-CHEMICAL PERIODICITY. By E. S. Hedges, M.Sc., Ph.D., and J. E. Myers, O.B.E., D.Sc., A.I.C. London: Edward Arnold and Co. Pp. 95. 7s. 6d.

The problem of periodicity or intermittency of chemical change has arisen in a large number of connections. Under the heading of periodicity may be included not only periodic chemical reactions—such as the evolution of hydrogen accompanying the dissolution of chromium acids, investigated by Astwald—but also periodic chemical structures, such as the Liesegang rings, which latter subject especially has been much investigated of late years, its study having advanced hand-in-hand with the development of colloid chemistry. As Professor Donnan points out in his foreword: "Although these phenomena have already received a considerable amount of investigation the underlying causes are still very largely obscure."

In the present volume, Drs. Myers and Hedges, who have themselves carried out a considerable amount of work directed towards the elucidation of periodic phenomena, review the whole subject. The large number of cases of periodicity which have been reported are grouped under various headings, their inter-relation being indicated wherever possible. The chapter headings are as follows: Static Periodicity; Periodic Structures; Periodic Chemical Reactions; Periodic Catalytic Decomposition of Hydrogen Peroxide; Miscellaneous Periodic Reactions; Periodic Electrochemical Phenomena; and Periodicity and the Metastable State. Mention must be made of the valuable bibliography which has been compiled. While not yet offering a general theory, the authors advance a tentative hypothesis of a general nature. In the case of a number of periodic reactions in which metals are involved the periodicity is thought to be connected with a "metastable, close-grained and possibly amorphous state of the metal." It is further pointed out that these properties are not necessarily peculiar to metals alone. "Periodic properties may be associated with the metastable, amorphous forms of substances other than metals. Colloids immediately suggest themselves . . . There is a very close analogy between a close-ground metal and a colloid system." Stress is also laid on the importance of the part played by surface action. "There are considerable grounds for the view that periodicity in chemical reactions is associated with surfaces which are in a metastable condition." The part played by surface tension is also considered.

The authors are to be congratulated on their presentment of the subject. Monographs on highly specialised subjects of this kind often tend to degenerate into a long string of wearisome and disconnected abstracts of the publications of the separate workers. While outlining the facts which have been collected, and the theoretical views emerging from them, the present writers have, by preserving a critical outlook and by envisaging the subject as a connected whole, imparted a large degree of continuity to their account, which can be read with pleasure. Their treatment inevitably succeeds in revealing a number of gaps, investigation into which is obviously necessary, and it may be predicted that the publication of this monograph will give considerable impetus to research on periodic phenomena. Reference is made to a number of biological examples of periodicity, as for example, the heart-beat. From this point of view it is clear that these chemical investigations will have important repercussions in other realms of science, and that upon them must ultimately be founded the elucidation of some of the great problems of biology and physiology.

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A STUDENT'S MANUAL OF ORGANIC CHEMICAL ANALYSIS, QUALITATIVE AND QUANTITATIVE. By J. F. Thorpe, C.B.E., D.Sc., Ph.D., F.R.S., F.I.C., and Martha A. Whiteley, O.B.E., D.Sc., A.R.C.S., F.I.C. Reissue with Appendix. London: Longmans, Green and Co. Pp. 282. 9s.

According to the introduction, this book, which was first published in 1925, is intended "for students who have already acquired a measure of chemical common sense, and who have learnt the usual manipulative methods and have completed a course of general preparation work on the usual lines." Actually it is likely to fulfil a much wider function, for it is much more than a dry-as-dust statement of methods and names. As a fruit of their long research experience, the authors are able to incorporate a large number of valuable "tips," which are usually to be learned only by long and arduous work, and lack of knowledge of which leads to difficulties which may dishearten even the best of students. The ground covered is as follows: detection of the elements in an organic compound; ultimate analysis; purification of compounds for analysis; reactions of the commoner compounds; detection and quantitative estimation of radicles; and an account of the investigation of an unknown compound or mixture. Finally, there are two important appendices on modern developments of analytical practice. The first deals with micro-analysis, giving an account of Dubsky's modification of Pregl's method. The second appendix, written by Professor H. Ter Meulen and J. Heslinga, describes the new methods of organic analysis which have been developed by them at Delft, some of which were demonstrated by Professor Ter Meulen at this year's meeting of the British Association at Oxford. Some of these methods are based on the combustion of substances in the presence of manganese dioxide, lead peroxide, etc. The rest involve the application of catalytic hydrogenation. The latter method has the important advantage of affording a direct determination of oxygen, while it may also be used for determining nitrogen, sulphur, halogens, arsenic, and mercury. It is likely to command a good deal of attention in the future. The low price of the book is noteworthy.

THE DISPENSATORY OF THE UNITED STATES OF AMERICA. *Twenty-first Edition. Based upon the Tenth Revision of the United States Pharmacopœia, National Formulary Fifth Edition, and the British Pharmacopœia, 1914.* By Horatio C. Wood, Junr., M.D., and Charles H. LaWall, Ph.M., D.Sc., Phar.D., London: J. B. Lippincott Co. Pp. 1,792. 65s.

In this volume are described official drugs and preparations recognised either by the United States or British Pharmacopœia; unofficial drugs; and substances used in clinical examinations, etc. Each substance is described under the official title, the purely chemical name being then given (*e.g.*, Antipyrina, U.S. (Br.); Antipyrine, Antipyr. [Phenazone]), followed by its French, German, and other foreign equivalents. The preparation, description, and physical properties, uses, toxicology, dosage, etc., are enumerated. An interesting feature of the book is the initial section, dealing with the United States Food and Drugs Act and the Harrison Narcotic Act. The ground covered in the Dispensatory may be judged by the dimensions of the index, which fills 100 pages. To the chemist interested in foods and drugs or therapeutic substances, and to the scientific medical man and pharmacist, this publication should prove invaluable.

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ANCIENT EGYPTIAN MATERIALS. By A. Lucas, O.B.E., F.I.C. London: Edward Arnold & Co. Pp. 242. 7s. 6d.

Archæology is one of the departments of study into which the assistance of the chemist has only been called of comparatively recent years. As far as the branch of Egyptology is concerned, the opinions of Mr. Lucas, who is chemist to the Department of Antiquities, Egypt, and who was formerly director of the Egyptian Chemical Department, must naturally command respect. The book as a whole forms interesting reading, but perhaps the chapter on metals will command greatest attention from chemists. Mr. Lucas's lucid account of the development and use of metals in Egypt is not only of value archæologically, but has very important bearings on the origins of chemistry. For example, the first production of copper in the history of the world appears to have taken place in Egypt, while other metals and alloys which seem to have been used there are antimony, bronze, brass, gold and silver and their alloys, iron, tin and lead. The chapter on oils, fats and waxes indicates how scanty is the information which has so far been obtained in this direction, and in this connection attention may be drawn to the results of "An Examination of Tut-Ankh-Amen's Cosmetic," recently communicated by Mr. A. Chaston Chapman, F.R.S., and Dr. H. K. Plenderleith to the British Association and the Society of Public Analysts. As far as ancient Egyptian dyes are concerned indigo (probably from India) and the yellow colouring matter of the safflower have been identified; while among pigments the use of calcium carbonate and sulphate, hæmatite, yellow and red ochre, azurite and malachite, orpiment, galena, and various forms of carbon has been established.

Wherever possible, Mr. Lucas relies on personal examinations and analyses. The book is written in an independent and impartial manner, and the author has, in some instances, found it necessary to cross swords with eminent Egyptologists and others. In regard to the much-discussed question of the use by the Egyptians of some method, the secret of which has been lost, of especially treating copper and bronze so as to impart to them the hardness of tool steel, he says bluntly that "no evidence of this kind has been found, and in the author's opinion no such method was known, nor is any such hardening possible." He implies doubt of the view which has been put forward that not only iron but steel must have been known to the Egyptians, and employed by them for working in hard stone. While information on some of the materials considered exists in ancient records, the author says that he has disregarded it almost entirely, on the ground that while it is of historical value it is not suitable for the purpose which he has in view, which is to establish certain facts by scientific evidence only. The wide dissemination of information such as is contained in this book should go far towards counteracting the absurd air of mystery with which ancient Egypt is commonly invested by unscientific people.

## Society of Public Analysts

AN ordinary meeting of the Society was held at the Chemical Society's Rooms, Burlington House, on Wednesday, February 2, Mr. E. Richards Bolton (president) being in the chair.

Certificates were read for the first time in favour of Messrs. W. G. Carey, F.I.C., W. F. Elvidge, B.Sc., A.I.C., L. S. Fraser, B.Sc., A.R.C.Sc., A.I.C., F. P. Hornby, B.Sc., A.I.C., G. R. Lynch, O.B.E., M.B., B.S., D.P.H., E. C. Martin, and G. G. Philip; and for the second time in favour of Messrs. S. Greenberg, F.I.C., F. C. Ray, M.A., F.I.C., and G. C. Matthews, B.Sc., A.I.C. Mr. S. G. Burgess, B.Sc., A.I.C., was elected a member.

### Arsenic in Printing Ink

In a paper by Mr. T. Hedley Barry it was pointed out that most of the printing ink pigments contained arsenic, and it was possible to classify them into three groups on the basis of the amounts of arsenic present. It was shown that a limit of 1 part of arsenic in 50,000 of the ink pigment should satisfy the most stringent requirements of health authorities, but this mode of expression was unsatisfactory, and it would be preferable to fix a limit of arsenic per unit area of the printed paper or wrapping.

### The Immersion Refractometer

"The Immersion Refractometer and Its Value in the Analysis of Milk" was the subject of a communication by Messrs. G. D. Elsdon, B.Sc., F.I.C., and J. R. Stubbs, M.Sc., F.I.C. In view of the importance which certain police courts, especially in the North of England, attach to the application of the refractometric test in milk analysis, the authors have investigated the test. Part I of the paper was an examination of the Zeiss Immersion Refractometer from the point of view of its use for milk. In Part II, experiments were quoted to show that the refraction of a milk serum apparently changed with two factors—the percentage of solids not fat and the acidity of the milk. The decreased refraction due to added water might be entirely masked by the souring of the milk; in fact up to 10 per cent. of added water might be entirely overlooked in this way. Details were given of the examination of about one thousand mixed milks, and the results showed that the average refraction for milk serum, when the copper sulphate method was used, was about 38·3 scale divisions in the case of commercially fresh milks. The conclusion was drawn that the method offered no advantage over the usual determinations, and that it had certain drawbacks peculiarly its own.

### Irish Moss Mucilage

A paper by Dr. Paul Haas and Barbara Russell-Wells dealt with "Irish Moss Mucilage and a Method for its Determination." Irish moss or carrageen mucilage, it was pointed out, consisted of a mixture of two ethereal sulphates. These could be determined by precipitation with benzidine chloride and titration of the washed precipitate with standard sodium hydroxide solution. Free sulphates, if present, were first precipitated by adding excess of barium chloride. The method could be used for the determination of carrageen mucilage in the presence of gelatin, gum arabic, agar-agar, and fruit pectins.

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### Presentation to Mr. John Allan

A PLEASANT function took place at the Mitre Hotel, Manchester, on Wednesday evening, when Mr. John Allan was presented with a gold cigarette case by his many friends who were former students at the College of Technology attending his oils and fats classes. Mr. Allan had been associated with the college for over 30 years. The inscription upon the cigarette case was as follows:—"Presented to John Allan, Esq., as a token of respect and esteem by his friends, members of his classes in Oils and Fats at the College of Technology, Manchester. 9th February, 1927." The presentation was the result of an earnest desire to show appreciation of the work of Mr. Allan and a token of regret at the severance of his connection with the College, rendered necessary by his increasing business interests. The presentation was made by Mr. L. Guy Radcliffe, the chairman of the Manchester Section of the Society of Chemical Industry.

## The Constants of Colour

### Hue, Purity, and Luminosity

A JOINT meeting of the Manchester Sections of the Society of Chemical Industry and the Oil and Colour Chemists' Association was held at the Textile Institute, Manchester, on Friday, February 4. Mr. J. B. Shaw presided.

A paper on "The Constants of Colour—Hue, Purity and Luminosity," was read by Mr. Charles W. Gamble, M.Sc.Tech., lecturer in photography in the University of Manchester and Director of the Department of Printing and Photographic Technology at the Manchester College of Technology.

Mr. Gamble said that colour was not the same thing to all men: to one person the dying fire at the end of a carbon rod might appear red, to another greenish-grey. A beam of light passed through a tank of clean, distilled water was scarcely visible until suitable reflectors of glass were placed in the water, whereupon the light was clearly scattered in all directions. Upon mixing a mastic solution of resin in alcohol in the water, the resin grains dispersed and scattered light. By increasing the quantity of resin grains the light varied from white to yellow and then to orange. A certain amount of interest attached to this experiment because it represented a very important natural phenomenon. What actually took place was a selective reflection or scattering. Lord Rayleigh had demonstrated that whenever light passed through a turbid medium it was scattered, and with, say, a pencil of white light the scattering which took place was inversely proportional to the fourth power of the wave-length. An increase in the number of particles gave a longer wave-length.

Many years ago the volcanic island of Krakatoa was completely blown up and the volcanic dust was carried by atmospheric waves at least three times round the earth, this matter in suspension being the cause of many very beautiful sunsets. The phenomenon of light-scattering was also the cause of similar beautiful sunsets frequently observed in smoky cities. Light was scattered by molecules of gas in the atmosphere, by water in the form of gas, by sensible particles of water upon which carbonaceous matter from smoke had deposited, and also by the fleecy forms of clouds, again resulting in beautiful sunsets. Light scattering by water particles created a sensation of blue in the sky.

Lustre was not quite the same thing as sheen, although somewhat similar in character. Lustre occurred when small elements of differing reflective power were associated together, such, for instance, as a fabric woven with alternate lines of mercerised cotton and ordinary cotton, wool and silk, and silk and cotton.

Long experience, said Mr. Gamble, had taught him how difficult it was to eradicate the impression that when white light fell upon a material termed red it was not a case of that substance turning white light into red. All colour in nature came from white light, and when it was stated that a particular material had colour what was implied was a kind of depreciation, or another form of the same kind of sunlight. A particle was red because it had the property of absorbing all that gave rise to the sensation of redness. The particles of a body absorbed some radiations and rejected others, and if energy was absorbed either there must be a rise in temperature or a chemical change; in the vast majority of cases it was the former.

There were three constants of colour—hue, luminosity or purity. Hue was the colour itself. Luminosity or purity meant freedom from admixture with white light. The luminosity of a colour might be measured either by its relative whiteness compared with white light before it passed through the dispersing arrangement in the spectroscope, or by the more common practice of measuring the luminosity of different regions of the spectrum taken at the brightest. Yellows were always brighter than red; reds were always brighter than blues.

It was interesting to know what amount of white might be added to a colour. If white was added to any colour to the extent of 75 times the brightness of the colour itself, the colour sensation disappeared; though this was not an exact amount for all colours. More white could be mixed with orange without any effect being perceived than with green, and still more with blue.

It was far easier to observe fine detail by monochromatic light than by heterochromatic light. The effect of a variation of illumination was shown by Mr. Gamble in the case of two fabrics. In daylight one of them matched very well as a moss green; with the Tungsten light it was brown. The second matched a fabric dyed blue with indigo; with the Tungsten light it was dull red.

In his reply to the discussion, Mr. Gamble stated that the "Tintometer" was an extraordinarily valuable instrument and its use did not require any very great skill beyond the ability to match colours.

## British Association of Chemists

### The "Third Party" Principle

It is of interest to note that this question is again being raised by the Society of Technical Engineers, and in this case in connection with the Liberal Industrial Inquiry. A memorandum has been prepared by the Society which sets forth in a very convincing way the most important points of the Third Party position. The memorandum is divided into 13 divisions and each deals pretty fully with the principal arguments for and against the policy.

Opposition comes principally from the Labour Party, which is not surprising, since the professional worker, realising that he has little to gain by association with the manual worker, has made no serious attempt to ally himself with him, and the Trade Union Congress had rather that the professional workers remained unorganised than that they should be invited in the support of a principle which a body accustomed to obtain their real or supposed rights by different methods cannot be expected to understand. To them the "middle position" smacks of such principles as compulsory arbitration; and they cannot emancipate themselves from the idea that an organised body, not under their control, will become a body for the defence of employers.

The example of Russia is an illustration of the unsatisfactory position of the professional worker when he is associated with the manual worker. The junior technical staff receive a lower wage than the workers they are supposed to control. They are suspected by the trade unions. They are constantly discharged and they see enemies on all sides. This is the admission of a Soviet leader. It is obvious that where they become a part of the general labour movement the smallness of their numbers will cause them to be dominated by the unions of the operatives.

Apart, therefore, from the strength of such a position, it is inevitably one which the professional worker must adopt. If he is not the employer's man, equally he will not find himself always in sympathy with the operative's point of view, so that in any case, without organisation of any sort, he finds himself in the position of a third party.

It is well known that the Association has from the beginning been an advocate of the principle, which, however, up to now has not been favourably regarded either by the Labour Party or by the employer. This has not prevented the Association adhering to the policy, and there is now some evidence of a change of heart. Particularly interesting in this connection has been the bearing of the late troubles upon this question and others allied to it. An attempt is being made to form an Industrial Peace Union, with its avowed object of peace in industry as the only means to industrial revival. Such a movement should give to the third party principle plenty of opportunity and scope, and where such a spirit is abroad, there is great hope for the near future.

For the Association a new year has just begun. It is one in which we shall hope to see considerable advances made forward from the present relations between employer and employed. This is a work in which all who are concerned with industry ought to share; and, as a preliminary, the chemist cannot do better than think out for himself the implications of the third party principle. H. T. F. R.

### A Chemist Sentenced

SENTENCE of 12 months' hard labour was passed by the Common Serjeant, Sir H. Dickens, K.C., at the Central Criminal Court, London, on Thursday, on Robert Brownlow, 49, industrial chemist and engineer, who pleaded guilty to incurring a debt of £5,000 to Emil Otto Schwartz and to obtaining credit without disclosing that he was an undischarged bankrupt.

# Hydrogenation of Coal

### Birmingham University Research Work

THE Joint Standing Committee for Research of the University of Birmingham in a report on last session deals with researches in progress in the Mining Laboratory, particularly in relation to hydrogenation, spontaneous combustion, and the research for the control of atmospheric conditions in hot and deep mines.

Regarding hydrogenation of coal, it is pointed out that progress has been made in the investigation into the conversion of coal into oil. A considerable amount of work has been carried out to obtain information regarding the type of coal most suitable for treatment in this way—*i.e.*, the type that will give the highest oil yield. Various specimens of coal of different degrees of coalification ranging from lignite to anthracite, and including also cannel coals from different sources, have been tested in detail with valuable results. Comparative tests have been carried out in the high pressure autoclave, using nitrogen in place of hydrogen, and also by carbonisation under atmospheric pressure. These experiments have yielded results of great importance and interest in that they have shown that the carbonaceous material which yields the greatest amount of tar and oil by carbonisation at low temperatures does not necessarily give the largest yield by hydrogenation. The experimental procedure is such as to obtain the products in the form of—Solid residue, insoluble in phenol; solid, soluble in phenol, insoluble in chloroform; liquid, soluble in phenol and in chloroform—*i.e.*, tar-oil.

In recent experiments the very volatile portion boiling below 150° C. has been isolated and gas measured and analysed. The large amount of product—definitely a product of hydrogenation—formed during the tests on some coals and the possibility of the conversion of this into oil by further hydrogenation points to the necessity for more detailed investigation of the physical and chemical nature of this product.

Other experiments carried out during the past year have included the treatment of bright coal (clarain) from the Warwickshire thick coal in the form of an exceedingly fine powder suspended in water (material ground in colloid mill) at various temperatures up to 360° C. and pressures up to 245 atmospheres. The work includes hydrogenation tests on the various portions into which coal may be separated by the solvent action of pyridine and chloroform and by means of phenol. The residue obtained after extraction with phenol of Warwickshire thick coal, vitrain (slate seam) has been tested in the high pressure autoclave—viz., their standard hydrogenation procedure, with instructive results.

### Spontaneous Combustion

As to spontaneous combustion, the experiments which have been carried out in order to obtain information regarding the influence of preheating of coal on its rate of absorption of oxygen are of importance not only from the point of view of spontaneous combustion underground, but also in connection with the liability of low temperature cokes to self-heat during storage. A considerable amount of valuable data has been obtained relative to the breathing as a result of barometric changes, in and out of a sealed-off area, and the influence of this on the production of heatings and fires. Arrangements have now been completed for the sampling of the gases from different positions at varying distance up to 550 yards behind a stopping. Recording water gauges and barographs have been used to ascertain the influence of barometric and ventilation changes upon the pressure of the gases in the sealed area. On account of the difference in mining conditions, similar researches are being undertaken in North Staffordshire, where the occurrence of spontaneous combustion and the applicability of delicate methods of gas analysis to the detection of underground heatings are being investigated.

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BEET SUGAR NEWS.—The Spalding beet sugar factory has now practically closed its winter campaign. The season has been so successful that it has been decided to double the factory's capacity before next season.—Approximately 125,000 acres were under cultivation for sugar beet in Great Britain in 1926, compared with 54,750 acres in 1925 and 22,634 acres in 1924.—Kelham (Newark) beet sugar factory has just concluded a most successful season. Four hundred and fifty men have been employed, and the factory cut a tonnage of 85,000 tons of beet.

## "C.A." Queries

*We receive so many inquiries from readers as to technical, industrial, and other points, that we have decided to make a selection for publication. In cases where the answers are of general interest, they will be published; in others, the answers will simply be passed on to the inquirers. Readers are invited to supply information on the subjects of the queries:—*

26 (*Perborate of Soda*).—"Can you give me the names of any important makers of perborate of soda?"

27 (*Gelatinous Silicic Acid*).—"I should be obliged if you would inform me of a manufacturer of gelatinous silicic acid in this country."

### Replies

24 (*Non-drying Adhesive Substance*).—W. T. Bruce and Co., Ltd., London, suggest liquid rosin, a residue from pulp making, large quantities of which are available at low prices.

## Pharmaceutical "Analysts"

*To the Editor of* THE CHEMICAL AGE.

SIR,—The letter of Mr. Carol A. Cofman-Nicoresti in the last issue of THE CHEMICAL AGE, shows the customary inability to reason which we might expect from a pharmacist. A century or so ago, a study of chemistry was in many cases only possible by way of a preliminary study as a pharmacist. The eminent scientists which he mentions, such as Liebig, Davy, and Tilden, were all professors of chemistry and hence *chemists*; they were investigators, not shop assistants in drug stores. The fact that a man takes the pharmaceutical qualification and subsequently takes a degree in chemistry, proceeding finally to research work, does not make him a pharmacist, any more than, if he takes an engineering diploma previous to a chemical degree, it makes him an engineer for all time. Many of us have taken engineering courses, previous to graduating in an Honours School of Chemistry, but that does not make us engineers! A collaborator of mine, who has recently been awarded his doctorate for a comprehensive research on sulphur compounds, once played in a jazz band, but this does not make him any less of a chemist. We do not doubt that wholesale drug houses employ pharmacists as analysts; plenty of ironworks employ lab.-boys for routine analytical work. Indeed, the letters of the Cofman Nicorestis demonstrate all too clearly the crying need for a definite pharmaceutical qualification such as the proposed Bachelor of Pharmacy Degree of the University of London.—Yours, etc.

R. F. HUNTER, M.Sc., Ph.D., D.I.C., A.R.C.S., etc.

## Photographic Sensitivity

AT a meeting of the London Section of the Society of Chemical Industry at Burlington House on Monday, February 7, Dr. T. Slater-Price, F.R.S., read a paper on "Photographic Sensitivity." Mr. C. S. Garland (chairman of the Section) presided.

Dr. Slater-Price said the ordinary emulsion as coated on glass, film or paper, was not as homogeneous as it appeared. It consisted of innumerable particles of silver halide embedded in a colloidal medium consisting of gelatine. The particles varied in size considerably, and the size distribution varied with different emulsions. The methods of making emulsion were almost infinite in number, and consequently the characteristics of the grains or particles varied considerably. As an indication of the number and size of the particles, it had been calculated that the grain population on an ordinary photographic plate was anything between 500 and 5 million grains per sq. in. of surface. This, at any rate, was sufficient indication that the investigation of the photographic plate is a very difficult one. In the early days of photographic science it was the mass behaviour of these grains that was studied, but since the mass behaviour depended upon the behaviour of the individuals it was obvious that the individual grains would have to be studied, and it was in this direction that great advances had been made in recent investigations.

Dr. Slater-Price discussed the characteristics of the emulsion as applied to photographic plates, to printing out papers and to development papers such as gaslight and bromide papers, and outlined some of the recent theories concerning the action of light into which enter considerations of crystal structure.

# From Week to Week

MR. R. C. MCGAFFIN, M.Sc. (Capetown), has been appointed head of the department of chemistry at the Witwatersrand Technical Institute, South Africa.

THE PITCH WORKS of Straker and Lowe commenced operations this week at Brancepeth Colliery and a number of unemployed in Willington have found work. The works have been idle since the strike in May.

SIR MAX MUSPRATT is one of five members appointed by the Government to attend the International Economic Conference which is to be held at Geneva in May next under the auspices of the League of Nations.

THE INTERMENT of the ashes of the late Mr. and Mrs. Roscoe Brunner took place recently in Lyne Churchyard, near Chertsey, next to the grave of Mr. Brunner's father, the Rt. Hon. Sir John Brunner, and his wife.

DR. G. ROCHE LYNCH, M.B., M.R.C.S., junior official analyst to the Home Office, and chemical pathologist to St. Mary's Hospital, London, has been appointed senior official analyst to the Home Office, in succession to the late Mr. John Webster.

THE NIAGARA AMMONIA CO., of Niagara Falls, N.Y., will shut down its anhydrous ammonia production plant on March 1. Mr. H. J. Pierce, the president of the Ammonia Corporation, states that the present price of ammonia makes it impossible to continue operations.

THE ROYAL SOCIETY invites applications for Government grants for scientific investigations. Applications, which must be made on printed forms to be obtained from the Clerk to the Government Grant Committee, Royal Society, Burlington House, London, W.1, must be received not later than March 31.

PROFESSOR H. E. ARMSTRONG will deliver the Horace Brown Memorial Lecture of the Institute of Brewing in the Lecture Theatre of the Institution of Electrical Engineers at 8.15 p.m. on Friday, February 25. The Horace Brown Medal will be presented to Professor Armstrong during the course of the evening.

SODIUM SULPHIDE manufactured by the German firms I.G. Farbenindustrie A.-G., Rhenania-Kunheim Verein Chemischer Fabriken A.-G., Concordia Chemische Fabrik auf Actien, Th. Goldschmidt A.-G., and B. Roos and Co., will in future be sold through the Schwefelnatrium G.m.b.H., a concern which commenced operations at the beginning of February.

AT A GENERAL MEETING of the members of the Royal Institution, held on Monday, Sir Arthur Keith, treasurer and vice-president, in the chair, thanks were returned to Dr. T. W. Dewar for his donation of £9 9s. to the research fund. Messrs. J. L. Callow, C. J. Ussher, C. V. H. Garnett, J. E. Joseph, M. H. Kilgour, Sir Henry Miers, Sir Joseph Petavel, Sir Richard Gregory, Miss E. M. G. Swann, Miss K. Thomas, and Miss A. H. Wilson were elected members.

THE SULPHURIC ACID PLANT of Mond Nickel Co., Coniston, Ont., is to double its capacity to 120 tons daily. This plant is the only one of the three existing sulphuric acid plants in Canada manufacturing this acid by the recovery of sulphur dioxide gases evolved in the smelting process. Some sulphuric acid is exported from Coniston to the United States, but its principal markets are in Toronto and Montreal, where it is used for the manufacture of chemicals, fertilisers, steel, explosives, dyes and tanning.

THE STAR PATENT FUEL CO., LTD., Cardiff, the capital of whose selling agents, the Maris Export and Trading Co., Ltd., is jointly held by the Powell Duffryn Steam Coal Co., and Stephenson, Clarke and Co., have acquired two acres of land and 450 feet of quay space on the west side of the Roath Basin, Cardiff, for the purpose of erecting a new patent fuel works and equipment for the rapid loading of vessels. The preparatory work is already in hand. The company also possess extensive works on the Glamorganshire Canal at Blackweir, near Cardiff.

DELEGATES FROM THE METALLURGICAL DEPARTMENTS of nearly all the universities of Great Britain were present at a conference held in Swansea University College last week. Among the matters discussed was a suggestion for achieving closer co-operation between the various metallurgical societies of the country, while it was decided to run a magazine to record the events taking place in the departments. It was also decided to formulate a scheme to enable students to visit the metallurgical centres of foreign countries. The president of the Swansea University society, Mr. T. Griffith, B.Sc., presided over the meetings.

APPLICATIONS ARE INVITED for the following appointments:—Assistant Government Analyst in Nigeria. £600–£30–£720–£40–£920, plus free quarters. The Private Secretary (Appointments), Colonial Office, 38, Old Queen Street, London, S.W.1. March 1.—Lecturer and Demonstrator in Organic Chemistry in the University of Sydney, New South Wales. £350–£40–£700. The Agent-General for New South Wales, Australia House, Strand, London, W.C.2. February 28.—Examiners in Chemistry for the London County Council. The Education Officer (G.P./G.), The County Hall, Westminster Bridge, London, S.E.1. February 21.

KELVIN, BOTTOMLEY AND BAIRD, LTD., of Cambridge Street, Glasgow, have transferred their London office from Hither Green to Imperial House, Regent Street, W.1.

AS A MEMORIAL to Michael Faraday, the scientist, who was born in Newington Butts, London, in 1791, Southwark Council are organising a collection of scientific books at the Central Library.

THE AMERICAN CELLULOSE AND CHEMICAL CO. has been awarded the contract for an extension to its dye plant at Amcelle, near Cumberland. An increased production of Celanese yarns and fabrics is contemplated.

THE READING GAS CO. have placed an order with the Woodall-Duckham Vertical Retort and Oven Construction Co. (1920), Ltd., for a T.I.C. (lead bath) tar treatment plant, to deal with 18 to 20 tons of crude tar per 24 hours.

THE BRITISH FEDERATION OF INDUSTRIES representatives, it is reported, will visit Berlin shortly, thus returning the visit of a number of German industrialists to London last year, when important matters of industry were discussed.

TAYLORS' DRUG CO., LTD., has been acquired on behalf of a new cash chemists' multiple shop business, which will be entirely under British control, and in connection with which the public issue of a share prospectus will be made at an early date.

THE PREPARATION OF RHENIUM (one of the most recently discovered elements) in larger quantities than those previously obtained was described by Messrs. Noddack and Berg at a meeting of the Deutsche Chemische Gesellschaft on January 17.

THE M'LAURIN SMOKELESS FUEL PROCESS installation at Dalmarnock Gasworks, Glasgow, was visited by a deputation from Newcastle on Tuesday, February 1, with a view to installing a similar plant for smoke abatement in that town.

THE CONSTITUTION of melezitose and turanose, two rare sugars, was dealt with on Tuesday at a meeting of the Physical and Chemical section of Armstrong College, in the Chemistry Lecture Theatre, by Dr. G. C. Leitch. Dr. P. L. Robinson presided, and a discussion followed the paper.

THE AUSTRALIAN CHEMICAL INSTITUTE has decided to approach the Institute of Chemistry of Great Britain and Ireland with a view to ascertaining if it is favourably disposed towards the adoption of the title "Chemologist" (originally suggested in Australia by Dr. W. A. Hargreaves) and to an effort being made to secure legal right for its exclusive use by properly accredited members of the profession.

THE FOLLOWING BRITISH FIRMS, among others, exhibited at the Seventh International Rubber and Other Tropical Products Exhibition in Paris:—The Western Chemical Co., Ltd., of Paisley (magnesium compounds for rubber, etc.); The Anchor Chemical Co., Ltd., of Clayton (rubber chemicals); Chance and Hunt, Ltd., of Oldbury (carbon blacks, etc.); The British Dyestuffs Corporation, Ltd. (dyestuffs, accelerators, anti-oxidants, etc.); the Cornbrook Chemical Co., Ltd., Stockport (colours for rubber).

ARRANGEMENTS HAVE BEEN COMPLETED whereby the paint and varnish firm of Docker Bros., of Saltley, will be associated as from January 1 last with Pinchin, Johnson and Co., Ltd. The business of Docker Bros., which is controlled by the Metropolitan Carriage, Wagon and Finance Co., will be carried on as a separate trading unit, and Mr. L. C. Docker, who has been chairman of the former concern for many years, as well as joint vice-chairman of the Metropolitan Carriage Co., will undertake to continue his present duties.

RECENT WILLS INCLUDE: Mr. Joseph Edwin Bentley, of Halifax, head of J. E. Bentley and Co., Ltd., dyers and finishers, of Dunkirk, Halifax, £4,491; Mr. John T. Arnold, of Lytham, Lancs, managing director of Arnold, Dean and Co., Egerton Dye Works, Patricroft, £55,196; Mr. William Mutton, of St. Austell, China Clay agent, £12,668; Mr. Percy Reginald Gaunt, of Calverley, near Leeds, member of the Advisory Committee on Textile Industries and Dyeing, of the University of Leeds, and a member of the Council of the British Research Association for the Woollen and Worsted Industries, £193,359.

UNIVERSITY NEWS.—The degree of D.Sc. (London) in chemistry has been conferred upon the following:—Mr. J. W. Cook (University College and the Sir John Cass Technical Institute), for a thesis entitled "The Reactivity of Meso-Substituted Anthracenes"; Mr. S. B. Dutt (Imperial College—Royal College of Science), for a thesis entitled "(1) A Theory of Colour on the Basis of Molecules Strain. The Effect of Chromophoric Superposition"; and Mr. W. G. Shilling (East London College), for a thesis entitled "The Temperature Coefficient of the Molecular Heat of Gases."—Mr. R. K. Callow, B.A., B.Sc., formerly Exhibitioner of Christ Church College, Oxford, has been elected to a senior scholarship at Christ Church for research in organic chemistry.—Mr. W. C. Lister, of the Chemical Laboratory, Cambridge, has been elected a member of the Managing Committee of the Pension Scheme until December 31, 1928, in place of the late Mr. F. J. Stoakley.

### Obituary

SIR JAMES KEMNAL, managing director of Babcock and Wilcox, Ltd., aged 63. He became joint managing director in 1891, and saw the capital of the company develop from £240,000 to £4,500,000.

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# Patent Literature

*The following information is prepared from published Patent Specifications and from the Illustrated Official Journal (Patents) by permission of the Controller to H.M. Stationery Office. Printed copies of full Patent Specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Abstracts of Complete Specifications

263,686. Low Temperature Carbonisation of Coal, Lignite, Shale, Peat, or the like. H. Whitehead, Hawkswood, Baildon, Yorkshire, and H. P. Hird, 21, Marriner Drive, Bradford, Yorkshire. Application date, July 8, 1926.

In the low temperature carbonisation of coal, lignite, shale, and peat at a temperature not above 800° C., the retort is made of metal having the characteristics of cold blast cast iron. The contents are consolidated during carbonisation, and passages are formed for the volatile products, by the provision of longitudinal bars of square or other non-circular cross section and preferably twisted to form a screw, these bars being rotated in either direction.

263,886. Titanium Compounds, Manufacture of. P. Spence and Sons, Ltd., A. Kirkham and H. Spence, Manchester Alum Works, Holland Street, Manchester. Application date, July 1, 1925.

The object is to prepare titanyl sulphate in the form $TiOSO_4H_2O$ as a dense granular crystalline substance. This salt is produced by regulating the temperature, ratio of acid to base, and the specific gravity. The salt can be washed by decantation, and on drying yields a fine powder containing a high percentage of $TiO_2$. A concentrated solution of titanium sulphate containing 4–12 molecules of $SO_3$ to each molecule of $TiO_2$ and having a specific gravity 1·58–1·61 is heated to 90°–130° C. The titanyl sulphate then crystallises out in a dense granular form. The crystallisation can be continued until the solution contains less than 0·5 gram $TiO_2$ per 100 cc. Solutions of titanium sulphate of lower acidity may be added during crystallisation. The crystalline salt may be washed with sulphuric acid, sodium sulphate, aluminium sulphate, purified titanium sulphate, etc. The speed of crystallisation is increased by working at the higher temperatures.

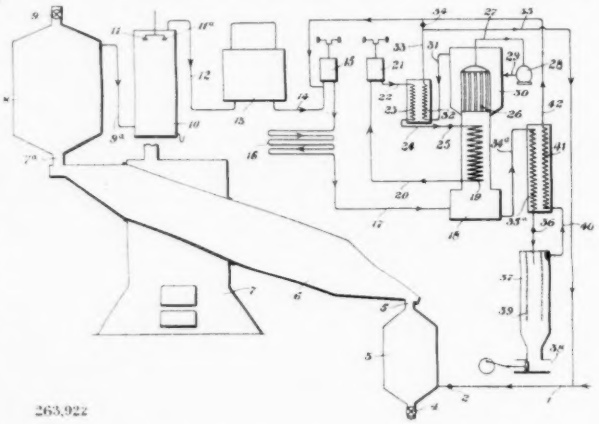
263,898. Dyes, Colouring Matters, Etc., Preparation of. B. Wylam, Carr House, Regent Street, Lancaster, J. E. G. Harris, Murrell Hill House, Carlisle, J. Thomas, and Scottish Dyes, Ltd., Earl's Road, Grangemouth, Stirlingshire. Application date, August 5, 1925.

Vat dyestuffs are treated with an alkyl ester of monochloracetic acid in the presence of a tertiary organic base of the type of quinoline or pyridine or a homologue of these, and a metal such as zinc. Part of the base may be replaced by a neutral diluent and the derivative may be subsequently treated with alkali. In an example, a suspension of flavanthrone in pyridine is treated with monochloracetic ester and copper. The mixture is heated to 100° C. yielding a blue-black paste which is washed free from pyridine and other water-soluble substances. The paste may be treated with caustic soda to obtain a deep blue-violet solution. Other examples describe the preparation of derivatives direct from dimethoxydibenzanthrone, indanthrene, dibenzanthrone, indigo, etc.

263,922. Carbon Dioxide, Manufacture of. P. E. Haynes, 335, Oakwood Avenue, East Aurora, N.Y., U.S.A. Application date, October 3, 1925.

Carbon dioxide is usually recovered from flue gases from the combustion of coke, but the conversion of the oxygen in the air is usually incomplete and the carbon dioxide is diluted with large volumes of oxygen and nitrogen. In view of the difficulty of isolating the carbon dioxide from this mixture, it is now found that carbon dioxide may be more efficiently obtained by isolating oxygen from air or water and converting it into carbon dioxide. The high temperatures produced by the combustion of carbon in oxygen are controlled by employing the heat to liberate the carbon dioxide from solid carbonates. Calcium carbonate is employed and this forms an economical method of obtaining quicklime. The carbon dioxide obtained is relatively pure, and can be liquefied at a pressure of 1,000 lb. per square inch with moderate cooling.

Oxygen is supplied through a pipe 1 to a receptacle 3 which receives the residue from the decomposed carbonate. The oxygen is thus warmed and passes into a rotating kiln 6 containing a mixture of calcium carbonate and coke. The carbon dioxide obtained from the burnt coke and from the calcium carbonate passes to a vessel 8 in which the mixture of coke and calcium carbonate is preheated. The gas then passes at approximately atmospheric pressure through a pipe 9ª to a gas washer 10 containing a carbonate which is kept hot by water from sprays 11. Any acid is thus neutralised, and the gas then passes to a reservoir 13 and thence to a compressor 15 where the pressure is raised to about 1,000 lb. per square inch. The gas is cooled in coils 16 and passes to a condensing tower 18 having a cooling coil 19 through



263,922

which a previously expanded refrigerant is passed. Vapour from the coil passes to a compressor 21 where it is raised to 1,000 lb. per square inch and then passes through a heat exchanging coil 23 to the expansion valve 25 and cooling coil 19. Gas which is not liquefied by the coil 19 passes through the condenser 26 and pipe 27 to a turbine 28, where its energy is utilised. The cold exhaust gas then passes to a jacket 30 surrounding the condenser 26, and thence to the heat exchanging coil 32 where it is warmed by the coil 23. This gas may then be returned through pipe 36 to pipe 1. The liquefied carbon dioxide passes through a pipe 34ª to a heat exchanger 35ª, and thence to an expansion valve 36 from which it issues into the tower 37 in the form of carbon dioxide snow. The unsolidified carbon dioxide passes through the heat exchanging coil 41 and pipe 42 back to the compressor 15.

263,933. Carbonaceous Substances, Manufacture of. T. M. Davidson, Holmleigh, Hatch End, Middlesex, and Patent Retorts, Ltd., 40–43, Norfolk Street, Strand, London, W.C.2. Application date, October 5, 1925.

This apparatus is for the distillation of low grade shales and other carbonaceous minerals of low grade. The kiln is of rectangular form in plan and is composed of vertical steel plates. A series of perforated steel pipes are arranged in the kiln in horizontal rows and tiers. The charge is ignited at the top and combustion proceeds downwards, and the distillation gases are drawn off through the perforated pipes. Air for combustion is admitted through openings in the side walls. The kiln is capable of being readily erected and taken down.

263,938–9. Cellulosic Materials, Treatment of, and Production of Cellulose Derivatives. H. Dreyfus, 8, Waterloo Place, London, S.W.1. Application date, October 6, 1925.

263,938. The object is to treat cellulosic materials to render them more reactive for esterification, especially acetylation. The cellulosic material is treated with vapours of lower fatty acids at ordinary or raised temperatures. This may be done by passing a stream of air or other inert gas

(*Continued on page 167*)

(*Continued from page* 166)

through acetic or other acid, and then over or through the cellulosic material. Alternatively, the acid vapour alone may be drawn through the cellulosic material by suction. The material is then subjected to a stream of air alone to remove any retained acid. In an example, mercerised or unmercerised cotton is treated in a revolving drum at a temperature up to 100° C. with a mixture of air and acetic acid vapour containing 50–70 per cent. of acetic acid, obtained by passing air through 70–100 per cent. acetic acid maintained at 70°–80° C. The treatment may be continued for about 10 hours and the material obtained is highly reactive to acetylation. The process may be modified by treating the cellulosic material with 50–100 per cent. formic acid, and then removing the acid by pressing, followed by a stream of air.

263,939. Cellulosic material which has been subjected to pretreatment with organic carboxylic acids as described in Specification No. 263,938 above are esterified or acetylised in the presence of condensing agents such as sulphuric acid in the proportion of 0·5 to 3 per cent. of the cellulose. The acetic acid employed is in the proportion of four to six times the weight of the cellulose. The acetylation may be carried out in the presence of 1 to 10 per cent. of organic solvents which have a greater solvent power compared with acetic acid for the acetylcellulose. These organic products counteract the tendency of the cellulose acetate to precipitate out. Suitable substances for this purpose are ethylidine diacetate, lactic acid, or its acetyl derivatives. If ethylidine diacetate is used, it may be recovered after acetylation either as acetaldehyde or by oxidation to acetic acid. The latter may be recovered with the acetic acid used in the acetylation. The acetylation may be effected in suspension in the presence of benzol or like non-solvent diluents.

NOTE.—Abstracts of the following specifications which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention :—244,130 (Soc. des Etablissements Barbet), relating to continuous apparatus for the preliminary refining of crude benzol, see Vol. XIV, p. 162 ; 249,834 (Petroleum Chemical Corporation), relating to preparation of alcohols from olefine-bearing gases, see Vol. XIV, p. 551.

### International Specifications not yet Accepted

262,119. ANTHRAQUINONE DERIVATIVES. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. International Convention date, November 28, 1925.

The nitrogenous anthraquinone derivatives obtained according to Specification 147,001 (see THE CHEMICAL AGE, Vol. III, p. 382) are treated with nitrous acid, or compounds liberating it, in presence of water to obtain 1-diazo-anthraquinone-2-carboxylic acids. These can be used for the production of azo dyes.

262,120. DEHYDROGENATED COMPOUNDS. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. International Convention date, November 30, 1925.

Sulphides of zinc, nickel, cobalt, iron, aluminium, cadmium, calcium, and magnesium, are used as catalysts in dehydrogenation processes, *e.g.*, isobutyraldehyde from isobutyl alcohol, isovaleraldehyde from isoamyl alcohol, cymene from turpentine, isobutyronitrile from isobutylamine.

262,141. DYES. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. (Assignees of Akt.-Ges. für Anilin-Fabrikation, Treptow, Berlin.) International Convention date, November 28, 1925.

2-amino-3-mercapto-1 : 4-naphthoquinone is obtained by treating 2-amino-3-chlor-1 : 4-naphthoquinone with sodium sulphide, and is then condensed with an aldehyde to obtain thiazole derivatives of 1 : 4-naphthoquinone. In an example, employing benzaldehyde, greenish-yellow crystals are obtained which form a blue-red vat, dyeing cotton a greenish-yellow. Dyestuffs obtained with other aldehydes are described.

262,148. CONDENSATION PRODUCTS OF METHYLOLUREAS. G. Walter, 18, Meytengasse, Vienna. International Convention date, November 28, 1925.

Methylol compounds of acid amides, *e.g.*, of acetamide, urea, or thiourea, are obtained by the action of non-aqueous formaldehyde with the acid amide in a solvent such as methyl, ethyl, or benzyl alcohol, and the product is precipitated by adding ether or carbon tetrachloride. Condensation products are obtained by rapidly melting methylolurea, dimethylolurea, or their thio derivatives, adding stabilising substances, and continuing the heating. A number of examples are given.

262,155. DIARYL-GUANIDINES. Chemische Fabrik Auf Actien (vorm. E. Schering), 170, Mullerstrasse, Berlin. International Convention date, November 30, 1925.

S-ethyl-isothiourea hydrobromide or S-methyl-isothiourea hydroiodide, or S-benzyl-isothiourea hydrochloride is heated with an excess of aniline till mercaptan is no longer evolved. Alkali is added, and *sym*-diphenyl-guanidine separates out. The aniline may be replaced by *o*-anisidine. These compounds have therapeutic properties.

262,397. SULPHURIC ACID. Metallbank und Metallurgische Ges. Akt.-Ges., 45, Bockenheimer Anlage, Frankfort-on-Main, Germany. International Convention date, December 7, 1925.

In the process described in Specification 184,966 (see THE CHEMICAL AGE, Vol. VII, p. 461), in which a mechanical mixing apparatus performs the function of a Glover tower, a Glover plant of the usual type is employed in addition. Concentration takes place in the Glover tower, and complete or partial dehydration in the mixing apparatus.

262,405. ALUMINIUM OXIDE. Aluminum Co. of America, 2,400, Oliver Building, Pittsburg, U.S.A. (Assignees of B. T. Horsfield, Badin, N.C., U.S.A.) International Convention date, December 4, 1925. Addition to 248,360.

Hollow globules of aluminium oxide obtained as described in Specification 248,360, are crushed and leached with sulphuric, hydrochloric, hydrofluoric, or sulphurous acid to remove residual metallic oxide impurities.

262,408. AMMONIUM CARBONATE. Rhenania-Kunheim Verein Chemischer Fabriken Akt.-Ges., 10, Reichstagsufer, Berlin. International Convention date, December 7, 1925.

Solid ammonium carbonate is produced from ammonia, carbon dioxide, and water, and the water is supplied in liquid form to the walls or other surfaces in the reaction chamber, which may be a horizontal or inclined cylinder.

262,418. DYES. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. International Convention date, December 1, 1925.

Azo dyestuffs are heated with salts of trivalent chromium with or without pressure, in the presence of metal salts not known to form compounds with the dyestuffs, other than salts of carboxylic or sulphonic groups present in the dyestuff. Thus, the dyestuff from diazotised 4-nitro-2-aminophenol-6-sulphonic acid and β-naphthol is heated with chromium formate and sodium chloride. The sodium chloride varies the colour of the dyestuff from violet-brown to black.

262,447, 262,454–5. PHOSPHORIC ACID. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. International Convention date, December 3, 1925.

262,447. Phosphoric acid and hydrogen are produced by the interaction of steam and phosphorus, and the residual gases are passed into a water-cooled condenser maintained above 100° C., which thus acts as a steam generator. The gases then pass to another condenser maintained below 100° C., and low pressure steam is produced. This is compressed to raise it above atmospheric pressure, so that it may be used again.

262,454. In the above process, steam is introduced through a Körting injector, and draws in liquid phosphorus. The mixed vapours pass over lignite coke and copper.

262,455. The residual hydrogen is freed from phosphorus and phosphoretted hydrogen, by passing it over active carbon or silica gel. The adsorbed substances are oxidised by air, and the acids then removed by washing and the adsorbent used again.

262,456. PURIFYING ALKALI CYANIDES. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. International Convention date, December 4, 1925.

Solutions of alkali cyanides are treated with bismuth salts or bismuth hydroxide to remove sulphur compounds.

262,457. Dyes. I.G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany. (Assignees of Farbwerke vorm. Meister, Lucius, and Brüning, Hoechst-on-Main, Germany.) International Convention date, December 4, 1925.

4 : 5 : 6 : 7-tetrahalogen-3-oxy-1-thionaphthene is condensed with a cyclic *o*-diketone such as isatin, 2 : 3-diketo-dihydrothionaphthene, or a substitution product or reactive α-derivative. Examples are given.

Latest Notifications.

265,124. Manufacture of sodium peroxide. Roessler and Hasslacher Chemical Co. January 29, 1926.

265,126. Apparatus for the purification of impure solutions of caustic soda or the like on osmotic principles. Cerini, L. January 29, 1926.

265,141. Process for the production of persulphuric acid and its soluble salts from sulphuric acid by electrolysis. Oesterreichische Chemische Werke Ges. January 28, 1926.

265,146. Manufacture of a glycerin poor in poly-glycerins and containing di-glycerin. Henkel and Cie, Ges. January 26, 1926.

265,147. Manufacture of a glycerin poor in poly-glycerins and containing di-glycerin. Henkel and Cie, Ges. January 27, 1926.

265,167. Manufacture of new derivatives of 2-aminopyridine. Chemische Fabrik Auf Actien (Vorm. E. Schering). January 27, 1926.

265,190. Process for the industrial manufacture of lead monoxide by a wet method. Tardan, J. J. January 30, 1926.

265,193. Manufacture of phthaloyl-2 : 3-thionaphthene and derivatives thereof. I. G. Farbenindustrie Akt.-Ges. January 29, 1926.

265,197. Manufacture of chemical manures. Rhenania-Kunheim Verein Chemischer Fabriken Akt.-Ges. February 1, 1926.

265,203. Manufacture of mordant-dyeing dyestuffs. Geigy Akt.-Ges., J. R. January 28, 1926.

265,212. Process of extracting vegetable oils. I. G. Farbenindustrie Akt.-Ges. January 27, 1926.

265,224. Manufacture of isatins and N-arylsulpho-compounds thereof. I. G. Farbenindustrie Akt.-Ges. January 28, 1926.

265,232. Manufacture of vat-dyestuffs. I. G. Farbenindustrie Akt.-Ges. January 29, 1926.

265,233. Manufacture and production of esters. I. G. Farbenindustrie Akt.-Ges. January 29, 1926.

265,234. Process for the production of valuable organic compounds from gaseous or vaporous hydrocarbons. I. G. Farbenindustrie Akt.-Ges. January 29, 1926.

## Specifications Accepted with Date of Application

244,424. Impure molten metal and molten metallic masses, Treatment of. H. Harris. December 11, 1924.

248,375. Olefines, Preparation and treatment of. Petroleum Chemical Corporation. February 24, 1925.

252,362. Plants for carrying out gaseous catalytic reactions at high temperature and pressure. G. L. E. Patart. May 25, 1925.

253,540. Ammonia, Manufacture of. Soc. d'Etudes Minières et Industrielles. January 8, 1925.

253,877. Maleic and succinic acid from furfural, Process for preparing. Zaidan Hojin Rikagaku Kenkyujo. June 22, 1925.

255,406. Glycol ethers and cellulose ester solvents. Carbide and Carbon Chemicals Corporation. July 20, 1925.

255,887. Esters from amide acid sulphates, Production of. Roessler and Hasslacher Chemical Co. July 22, 1925.

257,879. Adsorbing a gas or vapour from mixtures thereof, Method of and apparatus for. Silica Gel Corporation. September 4, 1925.

257,881. Alcohol and its homologues, and mixtures containing the same. Benzol-Verband Ges. September 4, 1925.

264,561. Vat colouring matters of the anthraquinone series, Manufacture and production of. J. Y. Johnson. (*Badische Anilin und Soda Fabrik.*) October 10, 1925.

264,584. Heat treatment and concentration of ores. E. Edser, B. Taplin, and Metals Production, Ltd. October 21, 1925.

264,591. Distillation plants. J. N. Hazeldon. October 21, 1925.

264,601. Phenol-urea-formaldehyde products, Process for hardening. H. V. Potter, J. W. Crump, and Damard Lacquer Co., Ltd. October 23, 1925.

264,631. Vat dyestuffs, Manufacture and production of. J. Y. Johnson. (*Badische Anilin und Soda Fabrik.*) November 19, 1925.

264,673. Vulcanising rubber, Process for. W. Carpmael. (*I. G. Farbenindustrie Akt.-Ges.*) February 15, 1926.

264,674. Condensation products of substituted acroleins, Manufacture of. W. Carpmael. (*I.G. Farbenindustrie Akt.-Ges.*) February 15, 1926.

264,682. Mono- and di-carbalkyloxy-diarylthioureas, Use of as accelerators in the vulcanisation of rubber. British Dyestuffs Corporation, Ltd., C. J. T. Cronshaw, and W. J. S. Naunton, March 1, 1926.

264,724. Sodium monoxide, Manufacture of. Roessler and Hasslacher Chemical Co. January 29, 1926. Addition to 253,520.

264,735. Distillation and like columns. C. Still and A. Kuhn. July 20, 1926.

264,549. Distilling hydrocarbons and other liquids, and fractionally condensing the vapours, Process and apparatus for. R. B. Millard, E. J. Atckison, C. D. Coulter, and South Western Engineering Corporation. August 19, 1925.

## Applications for Patents

Anderson, I. B., Scottish Dyes, Ltd., and Thomas, J. Production of benzanthrone derivatives. 3,050. February 2.

Bots, R. H., and Soc. Anon. Produits Chimiques Coverlin. Process of manufacturing vanillin. 3,022. February 2. (United States, May 25, 1926.)

Bots, R. H., and Soc. Anon. Produits Chimiques Coverlin. Process of manufacturing iso-eugenol. 3,023. February 2. (United States, May 25, 1926.)

British Dyestuffs Corporation, Ltd., and Cliffe, W. H. Obtaining derivatives of diaryl ketones. 3,341. February 5.

British Dyestuffs Corporation, Ltd., Davidson, A., and Shepherdson, A. Manufacture of anthraquinone derivatives. 3,339. February 5.

British Dyestuffs Corporation, Ltd., and Simmons, T. A. Manufacture of triarylmethane dyes. 3,340. February 5.

British Glues and Chemicals, Ltd. Process for degreasing bones, etc. 3,151. February 3.

Carpmael, W. (Chemische Fabrik auf actien vorm. E. Schering). Manufacture of metallo-mercapto compounds. 3,042. February 2.

Carpmael, W. (Chemische Fabrik auf actien vorm. E. Schering), and I. G. Farbenindustrie Akt.-Ges. Manufacture of triarylmethane dyestuffs. 2,924. February 1.

Carpmael, W. (Chemische Fabrik auf actien vorm. E. Schering). Manufacture of artificial silk. 3,041. February 2.

Carpmael, W. (Chemische Fabrik auf actien vorm. E. Schering). Manufacture of vat dyestuffs. 3,135. February 3.

Carpmael, W. (Chemische Fabrik auf actien vorm. E. Schering). Manufacture of 2·7 dinitroanthraquinone. 3,243. February 4.

Carpmael, W. (Chemische Fabrik auf actien vorm. E. Schering). Manufacture of anhydrides of acetic acid, etc. 3,244. February 4.

Coley, H. E. Manufacture of zinc. 3,016. February 2.

Gardner, D. Treatment of dyestuffs, etc. 3,350. February 5.

Gardner, D. Dyeing. 3,351. February 5.

Garland, C. S., and Pickard, J. A. Edge filtration. 2,766. January 31.

I. G. Farbenindustrie Akt.-Ges., and Johnson, J. Y. Manufacture of finely-divided metals. 3,235. February 4.

I. G. Farbenindustrie Akt.-Ges., and Johnson, J. Y. Production of carbon. 3,236. February 4.

I. G. Farbenindustrie Akt.-Ges., and Imray, O. Y. Manufacture of 1-phenyl-3-methyl-5-pyrazolone. 3,327. February 5.

I. G. Farbenindustrie Akt.-Ges. Manufacture of esters. 2,744. January 31. (Germany, January 29, 1926.)

I. G. Farbenindustrie Akt.-Ges. Production of organic compounds from hydrocarbon. 2,745. January 31. (Germany, January 29, 1926.)

I. G. Farbenindustrie Akt.-Ges. Manufacture of condensation products from naphthalene, etc. 3,134. February 3. (Germany, February 4, 1926.)

Lessing, R. Heat treatment of briquettes. 2,801. January 31.

Loeb, L. F., and Wreschner, M. Manufacture of preparation emitting β-rays. 3,133. February 3. (Germany, February 8, 1926.)

Naugatuck Chemical Co. Method of treating latex, etc. 2,764. January 31. (United States, March 24, 1926.)

Petroff, G. Production of emulsifiable, etc., preparations. 2,890, 2,894. February 1.

Petroff, G. Separating and purifying sulpho-acids. 2,891. February 1.

Petroff, G. Treating mineral and naphtha oils. 2,892, 2,896. February 1.

Petroff, G. Production of phenolic condensation products. 2,893. February 1.

Petroff, G. Splitting of fats, oils, etc. 2,895. February 1.

Petroff, G. Wet spinning of flax, etc. 2,897. February 1.

Riedel Akt.-Ges., J. D., and Vidal, A. E. Production of hydrogen peroxide. 3,204. February 4.

Robson, S. Preparation of sulphate of ammonia. 3,140, 3,153. February 3.

Rodd, E. H. Obtaining derivatives of diaryl ketones. 3,341. February 5.

# Weekly Prices of British Chemical Products

*The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.*

## General Heavy Chemicals

ACID ACETIC, 40% TECH.—£19 per ton.

ACID BORIC, COMMERCIAL.—Crystal, £34 per ton; powder, £36 per ton.

ACID HYDROCHLORIC.—3s. 9d. to 6s. per carboy d/d, according to purity, strength, and locality.

ACID NITRIC, 80° TW.—£21 10s. to £27 per ton, makers' works, according to district and quality.

ACID SULPHURIC.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations: 140° Tw., Crude Acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

AMMONIA ALKALI.—£6 15s. per ton f.o.r. Special terms for contracts.

BISULPHITE OF LIME.—£7 10s. per ton, packages extra, returnable.

BLEACHING POWDER.—Spot, £9 10s. per ton d/d; Contract, £8 10s. per ton d/d, 4-ton lots.

BORAX, COMMERCIAL.—Crystals, £19 10s. to £20 per ton; granulated, £19 per ton; powder, £21 per ton. (Packed in 2-cwt. bags, carriage paid any station in Great Britain.)

CALCIUM CHLORIDE (SOLID).—£5 12s. 6d. to £5 17s. 6d. per ton d/d carr. paid.

COPPER SULPHATE.—£25 to £25 10s. per ton.

METHYLATED SPIRIT 61 O.P.—Industrial, 2s. 5d. to 2s. 10d. per gall.; pyridinised industrial, 2s. 7d. to 3s. per gall.; mineralised, 3s. 6d. to 3s. 10d. per gall.; 64 O.P., 1d. extra in all cases; prices according to quantity.

NICKEL SULPHATE.—£38 per ton d/d.

NICKEL AMMONIA SULPHATE.—£38 per ton d/d.

POTASH CAUSTIC.—£30 to £33 per ton.

POTASSIUM BICHROMATE.—4½d. per lb.

POTASSIUM CHLORATE.—3½d. per lb., ex wharf, London, in cwt. kegs.

SALAMMONIAC.—£45 to £50 per ton d/d. Chloride of ammonia, £37 to £45 per ton, carr. paid.

SALT CAKE.—£3 15s. to £4 per ton d/d. In bulk.

SODA CAUSTIC, SOLID.—Spot lots delivered, £15 2s. 6d. to £18 per ton, according to strength; 20s. less for contracts.

SODA CRYSTALS.—£5 to £5 5s. per ton ex railway depots or ports.

SODIUM ACETATE 97/98%.—£21 per ton.

SODIUM BICARBONATE.—£10 10s. per ton, carr. paid.

SODIUM BICHROMATE.—3½d. per lb.

SODIUM BISULPHITE POWDER, 60/62%.—£17 per ton for home market, 1-cwt. iron drums included.

SODIUM CHLORATE.—2¾d. per lb.

SODIUM NITRITE, 100% BASIS.—£27 per ton d/d.

SODIUM PHOSPHATE.—£14 per ton, f.o.r. London, casks free.

SODIUM SULPHATE (GLAUBER SALTS).—£3 12s. 6d. per ton.

SODIUM SULPHIDE CONC. SOLID, 60/65.—£13 5s. per ton d/d. Contract, £13. Carr. paid.

SODIUM SULPHIDE CRYSTALS.—Spot, £8 12s. 6d. per ton d/d. Contract, £8 10s. Carr. paid.

SODIUM SULPHITE, PEA CRYSTALS.—£14 per ton f.o.r. London, 1-cwt. kegs included.

## Coal Tar Products

ACID CARBOLIC CRYSTALS.—6¼d. per lb. Crude 60's, 1s. 8½d. to 1s. 9½d. per gall.

ACID CRESYLIC 99/100.—2s. 3d. to 2s. 4d. per gall. Steady. 97/99.—2s. to 2s. 1d. per gall. Pale, 95%, 1s. 10d. to 2s. per gall. Dark, 1s. 9d. to 1s. 10d. per gall.

ANTHRACENE.—A quality, 2½d. to 3d. per unit. 40%, 3d. per unit.

ANTHRACENE OIL, STRAINED.—8d. to 8½d. per gall. Unstrained, 7½d. to 8d. per gall.; both according to gravity.

BENZOLE.—Crude 65's, 1s. 3d. to 1s. 4d. per gall., ex works in tank wagons. Standard Motor, 1s. 11d. to 2s. 4d. per gall., ex works in tank wagons. Pure, 2s. 2d. to 2s. 5d. per gall., ex works in tank wagons.

TOLUOLE.—90%, 1s. 11½d. to 2s. 3d. per gall. Firm. Pure, 2s. 2½d. to 2s. 6d. per gall.

XYLOL.—2s. 3d. to 2s. 6d. per gall. Pure, 4s. per gall.

CREOSOTE.—Cresylic, 20/24%, 10½d. per gall. Standard specification, 6¾d. to 9d.; middle oil, 7½d. to 8d. per gall. Heavy, 8½d. to 9d. per gall.

NAPHTHA.—Crude, 9½d. to 1s. 0½d. per gall. according to quality. Solvent 90/160, 2s. to 2s. 1d. per gall. Solvent 95/160, 1s. 10d. to 1s. 11d. per gall. Solvent 90/190, 1s. 3½d. to 1s. 4d. per gall.

NAPHTHALENE CRUDE.—Drained Creosote Salts, £8 per ton. Whizzed or hot pressed, £8 10s. per ton.

NAPHTHALENE.—Crystals, £11 10s. to £12 10s. per ton. Quiet. Flaked, £12 10s. per ton, according to districts.

PITCH.—Medium soft, 110s. to 120s. per ton, according to district. Prices nominal.

PYRIDINE.—90/140, 9s. 6d. to 17s. per gall. Nominal. 90/180, 7s. 6d. per gall. Heavy, 7s. to 10s. per gall.

## Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated:

ACID AMIDONAPHTHOL DISULPHO (1-8-2-4).—10s. 9d. per lb.

ACID ANTHRANILIC.—6s. per lb. 100%.

ACID BENZOIC.—1s. 9d. per lb.

ACID GAMMA.—8s. per lb.

ACID H.—3s. 3d. per lb. 100% basis d/d.

ACID NAPHTHIONIC.—1s. 6d. per lb. 100% basis d/d.

ACID NEVILLE AND WINTHER.—4s. 9d. per lb. 100% basis d/d.

ACID SULPHANILIC.—9d. per lb. 100% basis d/d.

ANILINE OIL.—7d. per lb. naked at works.

ANILINE SALTS.—7d. per lb. naked at works.

BENZALDEHYDE.—2s. 3d. per lb.

BENZIDINE BASE.—3s. 3d. per lb. 100% basis d/d.

BENZOIC ACID.—1s. 8½d. per lb.

*o*-CRESOL 29/31° C.—4d. to 4½d. per lb.

*m*-CRESOL 98/100%.—2s. 8½d. per lb.

*p*-CRESOL 32/34° C.—2s. 8½d. per lb.

DICHLORANILINE.—2s. 3d. per lb.

DIMETHYLANILINE.—2s. per lb. d/d. Drums extra.

DINITROBENZENE.—9d. per lb. naked at works.

DINITROCHLORBENZENE.—£84 per ton d/d.

DINITROTOLUENE.—48/50° C. 8d. per lb. naked at works. 66/68° C. 9d. per lb. naked at works.

DIPHENYLAMINE.—2s. 10d. per lb. d/d.

*a*-NAPHTHOL.—2s. per lb. d/d.

*B*-NAPHTHOL.—11d. to 1s. per lb. d/d.

*a*-NAPHTHYLAMINE.—1s. 3d. per lb. d/d.

*B*-NAPHTHYLAMINE.—3s. per lb. d/d.

*o*-NITRANILINE.—5s. 9d. per lb.

*m*-NITRANILINE.—3s. per lb. d/d.

*p*-NITRANILINE.—1s. 9d. per lb. d/d.

NITROBENZENE.—7d. per lb. naked at works.

NITRONAPHTHALENE.—1s. 3d. per lb. d/d.

R. SALT.—2s. 4d. per lb. 100% basis d/d.

SODIUM NAPHTHIONATE.—1s. 8½d. per lb. 100% basis d/d.

*o*-TOLUIDINE.—7½d. per lb. naked at works.

*p*-TOLUIDINE.—2s. 2d. per lb. naked at works.

*m*-XYLIDINE ACETATE.—2s. 11d. per lb. 100%.

## Wood Distillation Products

ACETATE OF LIME.—Brown, £9 per ton. Scarce. Grey, £17 5s. per ton. Liquor, 9d. per gall. 32° Tw.

CHARCOAL.—£8 5s. to £10 per ton and upwards, according to grade and locality. Very scarce and in fair demand.

IRON LIQUOR.—1s. 6d. per gall. 32° Tw. 1s. 2d. per gall. 24° Tw.

RED LIQUOR.—10d. to 11d. per gall. 16° Tw.

WOOD CREOSOTE.—2s. 9d. per gall. Unrefined.

WOOD NAPHTHA, MISCIBLE.—3s. 10d. to 4s. per gall., 60% O.P. Solvent, 4s. per gall., 40% O.P.

WOOD TAR.—£4 to £5 per ton and upwards, according to grade.

BROWN SUGAR OF LEAD.—£41 to £42 per ton.

## Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6d. to 1s. 5½d. per lb., according to quality, Crimson, 1s. 3d. to 1s. 7½d. per lb., according to quality.

ARSENIC SULPHIDE, YELLOW.—2s. per lb.

BARYTES.—£3 10s. to £6 15s. per ton, according to quality.

CADMIUM SULPHIDE.—2s. 9d. per lb.

CARBON BISULPHIDE.—£20 to £25 per ton, according to quantity.

CARBON BLACK.—5½d. per lb., ex wharf.

CARBON TETRACHLORIDE.—£46 to £55 per ton, according to quantity, drums extra.

CHROMIUM OXIDE, GREEN.—1s. 2d. per lb.

DIPHENYLGUANIDINE.—3s. 9d. per lb.

INDIARUBBER SUBSTITUTES, WHITE AND DARK.—5¾d. to 6¼d. per lb.

LAMP BLACK.—£35 per ton, barrels free.

LEAD HYPOSULPHITE.—9d. per lb.

LITHOPONE, 30%.—£22 10s. per ton.

MINERAL RUBBER "RUBPRON."—£13 12s. 6d. per ton f.o.r. London.

SULPHUR.—£9 to £11 per ton, according to quality.

SULPHUR CHLORIDE.—4d. per lb., carboys extra.

SULPHUR PRECIP. B.P.—£47 10s. to £50 per ton.

THIOCARBAMIDE.—2s. 6d. to 2s. 9d. per lb. carriage paid.

THIOCARBANILIDE.—2s. 1d. to 2s. 3d. per lb.

VERMILION, PALE OR DEEP.—5s. 3d. per lb.

ZINC SULPHIDE.—1s. 1d. per lb.

## Pharmaceutical and Photographic Chemicals

**Acid, Acetic, Pure**, 80%.—£39 per ton ex wharf London in glass containers.

**Acid, Acetyl Salicylic.**—2s. 4d. to 2s. 5d. per lb.

**Acid, Benzoic B.P.**—2s. to 2s. 3d. per lb., according to quantity. Solely ex Gum, 1s. 3d. per oz.; 500 oz. lots, 1s. per oz.

**Acid, Boric B.P.**—Crystal, £41 per ton; powder, £45 per ton. Carriage paid any station in Great Britain, in ton lots.

**Acid, Camphoric.**—19s. to 21s. per lb.

**Acid, Citric.**—1s. 3½d. per lb., less 5%.

**Acid, Gallic.**—2s. 8d. per lb. for pure crystal, in cwt. lots.

**Acid, Pyrogallic, Crystals.**—7s. 3d. per lb. Resublimed, 8s. 3d. per lb.

**Acid, Salicylic, B.P.**—1s. 4d. to 1s. 5d. per lb. Technical.—11½d. to 1s. per lb.

**Acid, Tannic B.P.**—2s. 9d. to 2s. 11d. per lb.

**Acid, Tartaric.**—1s. 0½d. per lb., less 5%.

**Amidol.**—9s. 6d. per lb., d/d.

**Acetanilide.**—1s. 7d. to 1s. 8d. per lb. for quantities.

**Amidopyrin.**—11s. 6d. per lb.

**Ammonium Benzoate.**—3s. 3d. to 3s. 6d. per lb., according to quantity.

**Ammonium Carbonate B.P.**—£37 per ton. Powder, £39 per ton in 5 cwt. casks. Resublimated: lump, 1s. per lb.; powder, 1s. 3d. per lb.

**Aspirin.**—2s. 4d. per lb. Good demand.

**Atropine Sulphate.**—11s. per oz. for English make.

**Barbitone.**—8s. 9d. per lb.

**Benzonaphthol.**—3s. 3d. per lb. spot.

**Bismuth Carbonate.**—12s. 3d. to 14s. 3d. per lb.

**Bismuth Citrate.**—9s. 3d. to 11s. 3d. per lb.

**Bismuth Salicylate.**—10s. to 12s. per lb.

**Bismuth Subnitrate.**—10s. 6d. to 12s. 6d. per lb., all above bismuth salts, according to quantity.

**Bismuth Nitrate.**—6s. 9d. per lb.

**Bismuth Oxide.**—13s. 9d. per lb.

**Bismuth Subchloride.**—11s. 9d. per lb.

**Bismuth Subgallate.**—9s. 9d. per lb.

**Borax B.P.**—Crystal, £24 per ton; powder, £25 per ton. Carriage paid any station in Great Britain, in ton lots.

**Bromides.**—Potassium, 1s. 11d. to 2s. per lb.; sodium, 2s. 2d. to 2s. 3d. per lb.; ammonium, 2s. 4d. to 2s. 5d. per lb., all spot. Market firmer.

**Calcium Lactate.**—1s. 4d. to 1s. 5d.

**Chloral Hydrate.**—3s. 3d. to 3s. 6d. per lb., duty paid.

**Chloroform.**—2s. 3d. to 2s. 7½d. per lb., according to quantity.

**Creosote Carbonate.**—6s. per lb.

**Ether Meth.**—1s. 1d. to 1s. 11½d. per lb., according to sp. gr. and quantity. Ether purif. (Aether B.P., 1914), 2s. 3d. to 2s. 4d., according to quantity.

**Formaldehyde.**—£39 per ton, in barrels ex wharf.

**Guaiacol Carbonate.**—6s. 6d. to 7s. per lb.

**Hexamine.**—2s. 4d. to 2s. 6d. per lb.

**Homatropine Hydrobromide.**—30s. per oz.

**Hydrastine Hydrochloride.**—English make offered at 120s. per oz.

**Hydrogen Peroxide (12 vols.).**—1s. 8d. per gallon f.o.r. makers' works, naked.

**Hydroquinone.**—4s. per lb., in cwt. lots.

**Hypophosphites.**—Calcium, 3s. 6d. per lb., for 28-lb. lots; potassium, 4s. 1d. per lb.; sodium, 4s. per lb.

**Iron Ammonium Citrate B.P.**—2s. 1d. to 2s. 4d. per lb. Green, 2s. 4d. to 2s. 9d. per lb. U.S.P., 2s. 2d. to 2s. 5d. per lb.

**Iron Perchloride.**—22s. per cwt., 112 lb. lots.

**Magnesium Carbonate.**—Light Commercial, £33 per ton net.

**Magnesium Oxide.**—Light Commercial, £67 10s. per ton, less 2½%; Heavy Commercial, £22 per ton, less 2½%; Heavy Pure, 2s. to 2s. 3d. per lb., in 1 cwt. lots.

**Menthol.**—A.B.R. recrystallised B.P., 18s. 9d. per lb. net; Synthetic, 10s. 6d. to 12s. per lb., according to quantity; 10s. 6d. for 1 cwt. lots and upwards; Liquid (95%), 12s. per lb.; Detached Cryst., 14s. 6d. per lb.

**Mercurials.**—Red Oxide, 6s. 5d. to 6s. 7d. per lb., levig., 6s. 1d. per lb.; Corrosive Sublimate, Lump, 4s. 3d. per lb., Powder, 4s. 3d. per lb.; White Precipitate, 5s. 1d. per lb., Powder, 5s. 1d. per lb., Extra Fine, 5s. 1d. to 5s. 2d. per lb.; Calomel, 5s. 3d. to 5s. 5d. per lb.; Yellow Oxide, 5s. 10d. to 5s. 11d. per lb.; Persulph., B.P.C., 5s. 1d. to 5s. 2d. per lb.; Sulph. nig., 4s. 10d. to 4s. 11d. per lb.

**Methyl Salicylate.**—1s. 9d. per lb.

**Methyl Sulphonal.**—15s. 6d. per lb.

**Metol.**—11s. per lb. British make.

**Paraformaldehyde.**—1s. 9d. per lb. for 100% powder.

**Paraldehyde.**—1s. 4d. per lb.

**Phenacetin.**—3s. 9d. to 4s. per lb.

**Phenazone.**—5s. 9d. to 6s. per lb.

**Phenolphthalein.**—6s. to 6s. 3d. per lb.

**Potassium Bitartrate** 99/100% (Cream of Tartar).—86s. per cwt., less 2½% for ton lots. Dearer.

**Potassium Citrate.**—1s. 11d. to 2s. 2d. per lb.

**Potassium Ferricyanide.**—1s. 9d. per lb., in cwt. lots.

**Potassium Iodide.**—16s. 8d. to 17s. 2d. per lb. for 1 cwt. lots.

**Potassium Metabisulphite.**—6d. per lb., 1-cwt. kegs included, f.o.r. London.

**Potassium Permanganate.**—B.P. crystals, 6½d. per lb., spot.

**Quinine Sulphate.**—2s. per oz., 1s. 8d. to 1s. 9d. for 1000 oz. lots in 100 oz. tins.

**Resorcin.**—4s. to 4s. 3d. per lb., spot.

**Saccharin.**—55s. per lb.

**Salol.**—3s. to 3s. 3d. per lb.

**Sodium Benzoate, B.P.**—1s. 10d. to 2s. 2d. per lb.

**Sodium Citrate, B.P.C., 1911.**—1s. 8d. to 1s. 11d. per lb. **B.P.C., 1923**—2s. to 2s. 1d. per lb. for 1 cwt. lots. **U.S.P.**, 1s. 11d. to 2s. 2d. per lb., according to quantity.

**Sodium Ferrocyanide.**—4d. per lb. carriage paid.

**Sodium Hyposulphite, Photographic.**—£15 5s. per ton, d/d consignee's station in 1-cwt. kegs.

**Sodium Nitroprusside.**—16s. per lb.

**Sodium Potassium Tartrate (Rochelle Salt).**—77s. 6d. to 82s. 6d. per cwt., according to quantity.

**Sodium Salicylate.**—Powder, 1s. 9½d. to 1s. 10½d. per lb. **Crystal**, 1s. 10d. to 1s. 11d. per lb.

**Sodium Sulphide, pure recrystallised.**—10d. to 1s. 2d. per lb.

**Sodium Sulphite, anhydrous**, £27 10s. to £28 10s. per ton, according to quantity; 1-cwt. kegs included.

**Sulphonal.**—10s. 6d. per lb.

**Tartar Emetic, B.P.**—Crystal or powder, 2s. to 2s. 2d. per lb.

**Thymol.**—Puriss., 11s. 9d. to 13s. 9d. per lb., according to quantity. Firmer. Natural, 14s. 9d. per lb. Cheaper.

## Perfumery Chemicals

**Acetophenone.**—7s. 3d. per lb.

**Aubepine (ex Anethol).**—10s. 6d. per lb.

**Amyl Acetate.**—2s. per lb.

**Amyl Butyrate.**—5s. 6d. per lb.

**Amyl Salicylate.**—3s. per lb.

**Anethol** (M.P. 21/22° C.).—5s. 6d. per lb.

**Benzyl Acetate from Chlorine-free Benzyl Alcohol.**—2s. per lb.

**Benzyl Alcohol free from Chlorine.**—2s. per lb.

**Benzaldehyde free from Chlorine.**—2s. 6d. per lb.

**Benzyl Benzoate.**—2s. 3d. per lb.

**Cinnamic Aldehyde Natural.**—18s. per lb.

**Coumarin.**—11s. per lb.

**Citronellol.**—15s. per lb.

**Citral.**—9s. 6d. per lb.

**Ethyl Cinnamate.**—10s. per lb.

**Ethyl Phthalate.**—3s. per lb.

**Eugenol.**—9s. 6d. per lb.

**Geraniol (Palmarosa).**—19s. per lb.

**Geraniol.**—6s. 6d. to 10s. 6d. per lb.

**Heliotropine.**—4s. 10d. per lb.

**Iso Eugenol.**—13s. 6d. per lb.

**Linalol.**—Ex Shui Oil, 12s. per lb. Ex Bois de Rose, 16s. per lb.

**Linalyl Acetate.**—Ex Shui Oil, 14s. 6d. per lb. Ex Bois de Rose, 18s. per lb.

**Methyl Anthranilate.**—9s. per lb.

**Methyl Benzoate.**—4s. 6d. per lb.

**Musk Ketone.**—36s. per lb.

**Musk Xylol.**—8s. 6d. per lb.

**Nerolin.**—3s. 9d. per lb.

**Phenyl Ethyl Acetate.**—12s. per lb.

**Phenyl Ethyl Alcohol.**—11s. per lb.

**Rhodinol.**—28s. 6d. per lb.

**Safrol.**—1s. 6d. per lb.

**Terpineol.**—1s. 6d. per lb.

**Vanillin.**—19s. per lb.

## Essential Oils

**Almond Oil.**—11s. 6d. per lb.

**Anise Oil.**—3s. 3d. per lb.

**Bergamot Oil.**—30s. per lb.

**Bourbon Geranium Oil.**—11s. 3d. per lb.

**Camphor Oil.**—63s. 6d. per cwt.

**Cananga Oil, Java.**—20s. per lb.

**Cinnamon Oil, Leaf.**—6d. per oz.

**Cassia Oil**, 80/85%.—8s. 9d. per lb.

**Citronella Oil.**—Java, 85/90%, 2s. 3d. per lb. Ceylon, pure, 1s 10d. per lb.

**Clove Oil.**—6s. per lb.

**Eucalyptus Oil**, 70/75%.—2s. per lb.

**Lavender Oil.**—Mont Blanc 38/40%, Esters, 20s. 9d. per lb.

**Lemon Oil.**—9s. 6d. per lb.

**Lemongrass Oil.**—4s. 6d. per lb.

**Orange Oil, Sweet.**—10s. per lb.

**Otto of Rose Oil.**—Bulgarian, 70s. per oz. Anatolian, 30s. per oz.

**Palma Rosa Oil.**—9s. 6d. per lb.

**Peppermint Oil.**—Wayne County, 22s. per lb. Japanese, 8s. 9d. per lb.

**Petitgrain Oil.**—8s. 3d. per lb.

**Sandalwood Oil.**—Mysore, 26s. per lb. Australian, 17s. 3d. per lb.

# London Chemical Market

***The following notes on the London Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.***

*London, February* 10, 1927.

TRADE generally this week has been without feature and continues quietly steady. There is still no evidence of desire on the part of the buyers to purchase larger quantities. Prices, generally speaking, continue very firm with an upward tendency. Export inquiry has been good.

## General Chemicals

ACETONE is somewhat steadier and there is a fair business reported at £57 10s. to £58 10s. per ton.

ACID ACETIC.—Prices are unchanged and demand on the whole is good, especially for export.

ACID CITRIC.—Continues quiet and the price continues round about 1s. 2d. per lb.

ACID FORMIC is extremely firm, although demand continues moderate.

ACID LACTIC.—Continues very steady at £43 per ton, for 50% by weight with an improvement in the demand.

ACID TARTARIC.—There is no change in the market position to report and second-hand parcels really rule the market at the moment; to-day the material can be purchased at from 11⅜d. to 11½d. per lb.

ALUMINA SULPHATE is firm and unchanged at £6 7s. 6d. per ton, for 17-18%, with a good business reported.

AMMONIUM CHLORIDE is quietly steady at £19 per ton.

BARIUM CHLORIDE.—Has been more active at £9 15s. to £10 per ton; the material has a firmer tendency.

COPPER SULPHATE is inclined to be firmer at £24 per ton, and there is a considerable inquiry in evidence.

CREAM OF TARTAR.—Continues firm with spot supplies being quoted at £83 to £84 per ton.

EPSOM SALTS.—This market continues very firm and the material is in good demand; to-day's quotation is round about £5 10s. per ton delivered.

FORMALDEHYDE.—Demand is somewhat better and price is firm at £42 to £43 per ton, with a higher tendency.

LEAD ACETATE.—Continues a firm market at £45 per ton for white, and £43 per ton for brown.

METHYL ACETONE is a firm spot at £60 to £61 per ton, supplies being on the short side.

METHYL ALCOHOL.—Continues quiet and unchanged at £46 per ton.

POTASSIUM CHLORATE.—Unchanged at 3½d. to 3¾d. per lb.

POTASSIUM PERMANGANATE.—Continues steady at 7½d. per lb., for B.P. quality, with a moderate demand.

POTASSIUM PRUSSIATE.—Remains extremely firm and in somewhat short supply, the present quotation being 7½d. per lb.

SODIUM ACETATE.—Has been in good inquiry and quite a substantial business has been transacted at from £19 to £19 15s. per ton.

SODIUM BICHROMATE is in good demand at British makers' prices.

SODIUM HYPOSULPHITE is also unchanged at British makers' figures.

SODIUM NITRITE seems to be a shade easier at £19 7s. 6d. to £19 15s. per ton.

SODIUM PRUSSIATE.—Continues firm and price tends upwards; the present quotation is 4⅝d. to 4¾d. per lb.

SODIUM SULPHIDE.—Prices are well held at British makers' figures and the Continental competition recently in evidence seems to be disappearing.

ZINC SULPHATE is a firm spot at round about £14 per ton, with a good demand.

## Coal Tar Products

The market for coal tar products is fairly steady, with little change in prices from last week.

90's BENZOL is quoted at 1s. 9¼d. per gallon, on rails, while the motor quality is quoted at about 1s. 8¾d. per gallon.

PURE BENZOL is worth from 2s. 9d. to 3s. per gallon.

CREOSOTE OIL is quoted at from 7¼d. to 7½d. per gallon, on rails in the country, while the price in London is about 8¼d. to 8¾d. per gallon.

CRESYLIC ACID is steady at 2s. per gallon, on rails, for the pale quality 97-99%, while the dark quality 95-97% is worth about 1s. 11d. per gallon.

SOLVENT NAPHTHA is unchanged from last week, and is quoted at about 1s. 5d. per gallon, on rails.

HEAVY NAPHTHA is quoted at 1s. 2d. to 1s. 3d. per gallon, on rails.

NAPHTHALENES are unchanged, the 76-78 quality being worth about £8 5s. to £8 15s. per ton, while the 74-76 quality is worth about £7 15s. to £8 per ton.

PITCH.—There is little change to report. Supplies are none too abundant, but the demand is also on the small side. To-day's price f.o.b. U.K. port is 110s. per ton to 130s. per ton.

## Latest Oil Prices

LONDON.—LINSEED OIL steady at 2s. 6d. to 5s. advance. Spot, ex mill, £33 5s.; February, £31 17s. 6d.; March-April, £31 15s.; May-August, £31 12s. 6d.; and September-December, £32. RAPE OIL steady. Crude extracted, £45 10s.; technical refined, £47 10s., ex wharf, naked. COTTON OIL firm. Refined common edible, £40; Egyptian crude, £34 10s.; deodorised, £42. TURPENTINE.—The market was quiet and quotations were 1s. 6d. to 1s. 9d. lower. American, on the spot, 50s.; March-April, 51s.; May-December, 52s. per cwt.

HULL.—February 8.—LINSEED OIL.—Naked, spot and February £32 2s. 6d.; March-April and May-August, £32; September-December, £32 7s. 6d. COTTON OIL.—Naked, Bombay crude, £33; Egyptian crude, £35 5s.; edible refined, £38 10s.; technical, £37 10s.; and deodorised, £40 10s. PALM KERNEL OIL.—Crushed naked, 5½ per cent., £39 10s. GROUNDNUT OIL.—Crushed-extracted, £42 10s.; deodorised, £46 10s. RAPE OIL.—Crude-extracted, £45; refined, £47 per ton, net, cash terms, ex mill. CASTOR OIL.—Pharmaceutical, 52s. 6d.; first, 47s. 6d.; and second, 45s. 6d. per cwt., in barrels. COD OIL unaltered.

## Calcium Cyanamide

A GOOD demand has been experienced, particularly in the sugar beet districts. The February price £9 14s. per ton delivered in four-ton lots, carriage paid to any railway station in Great Britain, gives a unit price of 10s. 2d.

## Nitrogen Products

*Export.*—British producers are still offering small quantities for export from time to time on the basis of £11 2s. 6d. per ton, f.o.b. U.K. port, in single bags. The demand for sulphate of ammonia continues quietly in the large consuming countries, and stocks are being reduced steadily.

*Home.*—It is understood that buyers in the early consuming centres have placed large orders. It is anticipated in the trade that the lower prices for sulphate of ammonia, together with the greater difference per unit of nitrogen in sulphate and nitrate prices will operate to increase the consumption of sulphate. Of course, the consumption in certain areas depends on the weather.

*Nitrate of Soda.*—Large sales of nitrate have been reported in several consuming countries. Importers are covering later requirements, and the statistical position of the producers has improved. The price in consuming centres in the United Kingdom varies from £13 to £13 5s. per ton, f.o.r.

## Synthetic Ammonia in Norway

THE Norsk Hydro-Elektrisk Kvaelstofaktieselskab, who are large producers of nitrogen from the air, are going to start again the manufacture of ammonium nitrate, which has not been produced during the last few years, at the plants at Notodden. The ammonia, which was formerly obtained by saponification of calcium cyanamide, is now to be produced synthetically, by a process somewhat related to that of Haber, for which purpose a factory will be built at Notodden. The Norsk Hydro have long been engaged in research on ammonia synthesis, and the general opinion is that this new plant is only a continuation of the experiments on an extended scale, meaning that they are planning to rearrange the bulk of their production from the Birkeland-Eyed saltpetre process to the synthesis of ammonia.

THE PARIS ACADEMY OF SCIENCES has awarded the following prizes: The Montyon Prize (2,500 francs, unhealthy trades), to Ernest Portier for his work as a whole on industrial hygiene, and an honourable mention (1,500 francs) to Louis Chelle for his researches on gases used in warfare; the Jecker Prize is divided between André Wahl (6,000 francs) for his work in organic chemistry and Gustave Vavon (4,000 francs) for his researches on catalysis with platinum black; the La Caze Prize to André Job for his researches on the mechanism of oxidation; the Cahours Foundation between Raymond Delaby for his work on the homologues of glycerol, and Michel Samson for his work on glass; the Houzeau Prize to Louis Hackspill for his work in inorganic chemistry.

# Scottish Chemical Market

***The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.***

*Glasgow, February* 9, 1927.

THE volume of business put through in heavy chemicals during the past week has been fairly satisfactory, with an appreciable amount of buying for early forward delivery. Prices remain about the same level as last reported.

### Industrial Chemicals

ACID ACETIC.—98/100%, £55 to £67 per ton, according to quality and packing, c.i.f. U.K. ports; 80% pure, £37 10s. per ton, ex wharf; 80% technical, £37 10s. per ton, ex wharf.

ACID BORIC.—Crystal, granulated or small flakes, £34 per ton; powder, £36 per ton, packed in bags carriage paid U.K. stations.

ACID CARBOLIC, ICE CRYSTALS.—In rather better demand and quoted price unchanged at 6¼d. per lb., delivered or f.o.b. U.K. ports.

ACID CITRIC, B.P. CRYSTALS.—Quoted 1s. 2¾d. per lb., less 5%, ex store. Offered for prompt shipment from the Continent at 1s. 2¼d. per lb., less 5%, ex wharf.

ACID HYDROCHLORIC.—Usual steady demand. Arsenical quality 4s. 9d. per carboy. Dearsenicated quality, 6s. 3d. per carboy, ex works.

ACID NITRIC, 80°.—Quoted £23 5s. per ton, ex station, full truck loads.

ACID OXALIC, 98/100%.—Spot material unchanged at about 4d. per lb., ex store. On offer from the Continent at 3⅞d. per lb., ex wharf.

ACID SULPHURIC, 144°.—£3 12s. 6d. per ton; 168°, £7 per ton, ex works, full truck loads. Dearsenicated quality, 20s. per ton more.

ACID TARTARIC, B.P. CRYSTALS.—Offered for early shipment at 11¼d. per lb., less 5%, ex wharf. Spot material quoted 11½d. per lb., less 5%, ex store.

ALUMINA SULPHATE, 17/18%, IRON FREE.—Spot material on offer at about £6 per ton, ex store. Quoted £5 8s. 6d. per ton, c.i.f. U.K. ports, prompt shipment from the Continent.

ALUM, POTASH.—Lump quality quoted at about £8 7s. 6d. per ton, c.i.f. U.K. ports. Crystal powder 5s. per ton less. Spot prices, £9 2s. 6d. and £8 10s. per ton, ex store respectively.

AMMONIA ANHYDROUS.—On offer at 9¾d. per lb., ex store. Containers extra and returnable.

AMMONIA CARBONATE.—Lump, £37 per ton; powder, £39 per ton, packed in 5 cwt. casks delivered or f.o.b. U.K. ports.

AMMONIA LIQUID, 880°.—Unchanged at about 2¾d. to 3d. per lb., delivered according to quantity.

AMMONIA MURIATE.—Grey galvanisers' crystals of British manufacture quoted £23 to £24 per ton, ex station. Continental material on offer at about £20 15s. per ton, c.i.f. U.K. ports. Fine white crystals of Continental manufacture quoted £18 15s. per ton, c.i.f. U.K. ports.

ARSENIC, WHITE POWDERED.—In moderate demand and supply for early delivery still limited. Quoted £19 15s. per ton, ex wharf. Spot material on offer at £20 5s. per ton, ex store.

BARIUM CARBONATE, 98/100%.—White powdered quality quoted £6 15s. per ton, c.i.f. U.K. ports.

BARIUM CHLORIDE, 98/100%.—Large white crystals quoted £8 per ton, c.i.f. U.K. ports, packed in bags. Casks, 7s. 6d. per ton extra. Offered on spot at about £9 12s. 6d. per ton, ex store.

BARYTES.—English material unchanged at £5 5s. per ton, ex works. Continental quoted £5 per ton, c.i.f. U.K. ports.

BLEACHING POWDER.—Contract price to consumers, £8 per ton, ex station, minimum 4 ton lots. Spot material, 10s. per ton extra. Continental now quoted £7 10s. per ton, c.i.f. U.K. ports.

BORAX.—Granulated, £19 10s. per ton; crystals, £20 per ton; powder, £21 per ton, carriage paid U.K. ports.

CALCIUM CHLORIDE.—English manufacturers' price unchanged at £5 12s. 6d. to £5 17s. 6d. per ton, ex station. Continental on offer at £3 15s. per ton, c.i.f. U.K. ports.

COPPERAS, GREEN.—Unchanged at about £3 10s. per ton, f.o.r. works, or at £4 12s. 6d. per ton, f.o.b. U.K. ports for export.

COPPER SULPHATE.—English material quoted £23 per ton, f.o.b. U.K. ports. Continental on offer at £21 10s. per ton, c.i.f. U.K. ports.

FORMALDEHYDE, 40%.—Quoted £38 10s. per ton. c.i.f. U.K. ports. Spot material available at about £40 per ton, ex store.

GLAUBER SALTS.—English material unchanged at £4 per ton, ex store or station. Continental now quoted £2 15s. per ton, c.i.f. U.K. ports.

LEAD, RED.—Imported material on offer at about £33 15s. per ton, ex store.

LEAD, WHITE.—Quoted £35 per ton, ex store.

LEAD ACETATE.—White crystals quoted £43 per ton, c.i.f. U.K. ports; brown about £40 10s. per ton, c.i.f. U.K. ports; white crystals offered on spot at about £44 10s. per ton, ex store.

MAGNESITE, GROUND CALCINED.—Quoted £8 10s. per ton, ex store. in moderate demand.

MAGNESIUM CHLORIDE.—Quoted £6 per ton, c.i.f. U.K. ports.

POTASH, CAUSTIC, 88/92%.—Solid quality unchanged at £27 5s. per ton, c.i.f. U.K. ports, minimum 15 ton lots. Smaller quantities 15s. per ton extra. Liquid, 50°, Be, £14 10s. per ton, c.i.f. U.K. ports, minimum 15 ton lots.

POTASSIUM BICHROMATE.—Unchanged at 4½d. per lb., delivered.

POTASSIUM CARBONATE.—96/98%, quoted £25 5s. per ton, ex wharf, early delivery. Spot material on offer at £26 10s. per ton, ex store; 90/94% quality quoted £22 5s. per ton, c.i.f. U.K. ports.

POTASSIUM CHLORATE, 98/100%.—Quoted £24 10s. per ton, c.i.f. U.K. ports; powdered quality crystals £2 per ton extra.

POTASSIUM NITRATE (SALTPETRE).—On offer for prompt shipment from the Continent at £21 5s. per ton, c.i.f. U.K. ports. Spot material available at £23 5s. per ton, ex store.

POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Quoted 6¾d. per lb., ex store, spot delivery. On offer for early shipment at 6½d. per lb., ex wharf.

POTASSIUM PRUSSIATE (YELLOW).—In good demand and spot material unchanged at 7½d. per lb., ex store. Offered for forward delivery at 7¼d. per lb., delivered c.i.f. U.K. ports.

SODA CAUSTIC.—Powder, 98/99%, £19 7s. 6d. per ton; 76/77%, £15 10s. per ton; 70/72%, £14 10s. per ton, carriage paid station, minimum 4 ton lots, on contract. Spot material 10s. per ton extra.

SODIUM ACETATE.—English material quoted £22 10s. per ton, ex store. Continental on offer at about £19 per ton, c.i.f. U.K. ports.

SODIUM BICARBONATE.—Refined recrystallised quality, £10 10s. per ton, ex quay or station. M.W. quality, 30s. per ton less.

SODIUM BICHROMATE.—Quoted 3¼d. per lb., delivered buyers' works.

SODIUM CARBONATE (SODA CRYSTALS).—£5 to £5 5s. per ton, ex quay or station; powder or pea quality, £1 7s. 6d. per ton more; alkali, 59%, £8 12s. 3d. per ton, ex quay or station.

SODIUM HYPOSULPHITE.—Large crystals of English manufacture quoted £9 2s. 6d. per ton, ex station, minimum 4 ton lots. Continental quality offered at £8 per ton, ex wharf, prompt shipment, packed in bags. Casks 10s. per ton extra. Pea crystals, photographic quality, of British manufacture quoted £14 10s. per ton, ex station.

SODIUM NITRATE.—Ordinary quality quoted £13 per ton, ex store. Refined quality 5s. per ton extra.

SODIUM NITRITE, 100%.—On offer at £21 per ton, ex store, spot delivery.

SODIUM PRUSSIATE (YELLOW).—Now quoted 4⅜d. per lb., ex store, spot delivery. Offered for prompt shipment at 4¼d. per lb., ex wharf.

SODIUM SULPHATE (SALTCAKE).—Price for home consumption, £3 7s. 6d. per ton, ex works.

SODIUM SULPHIDE.—60/65%, solid, £12 10s. per ton; broken, £13 10s. per ton; flake, £14 10s. per ton; crystals, 31/34%, £8 10s. per ton, and £9 per ton, according to quality, delivered buyers' works, minimum 4 ton lots on contract. Price for spot 5s. per ton extra, for solid, 2s. 6d. per ton, extra for crystals; 60/62%, solid quality offered from the Continent at about £9 7s. 6d. per ton, c.i.f. U.K. ports; broken, 15s. per ton extra.

SULPHUR.—Flowers, £12 10s. per ton; roll, £11 10s. per ton; rock, £11 10s. per ton; floristella, £11 per ton; ground American, £9 15s. per ton; ex store. Prices nominal.

ZINC CHLORIDE.—British material, 98/100%, quoted £24 15s. per ton, f.o.b. U.K. ports; 98/100%, solid on offer from the Continent at about £21 15s. per ton, c.i.f. U.K. ports. Powdered, 20s. per ton extra.

ZINC SULPHATE.—Continental material on offer at about £10 10s. per ton, ex wharf.

NOTE.—The above prices are for bulk business, and are not to be taken as applicable to small parcels.

### Coal Tar Intermediates

H. ACID.—3s. 3d. per lb., per 100%. Some home inquiries.

ORTHO TOLUIDINE.—8d. per lb. Some inquiries.

BENZOIC ACID.—1s. 8½d. per lb., Some inquiries.

ALPHA NAPHTHYLAMINE.—1s. 3d. per lb. Some inquiries.

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THE TRANSFORMATION OF ARTIFICIAL SILK from a luxury fabric into an all-purpose material is signalised by the decision to repeat this year the successful exhibition of British artificial silk goods first held last year. Mr. A. M. Samuel, M.P., Parliamentary Secretary to the Department of Overseas Trade, will open the Exhibition at the Holland Park Hall, from April 4 to April 9.

# Manchester Chemical Market

(From Our Own Correspondent.)

*Manchester, February* 10, 1927.

Values of heavy chemical products on the Manchester market during the past week have kept up pretty well in most sections, and the general tendency seems to be towards further steadiness, in spite of the fact that in a few instances the tone is still rather weak. As far as the volume of trade is concerned home consumption shows some improvement on what it has been latterly, although there is a long way to go before sales can be regarded as satisfactory; for shipment demand has been only moderate, but rather more inquiry has been reported during the last day or two in some sections of the market.

### Heavy Chemicals

Glauber salts have been moving off only in small quantities and some easing off in price is apparent, current quotations ranging from £3 5s. to £3 10s. per ton. Phosphate of soda meets with a moderate demand and values keep steady at up to £12 15s. per ton. Hyposulphite of soda is maintained at about £15 5s. per ton for photographic material and £10 for commercial, and a quietly steady trade is being put through. For bleaching powder round £8 per ton continues to be asked and a fair inquiry is being met with. Quotations for chlorate of soda are in the neighbourhood of 3d. per lb. and there seems to be only a strictly limited buying interest shown in this material at the present time. Alkali is a steady trade and prices are held at £6 15s. per ton. Nitrite of soda is in moderate request, and perhaps a shade easier than it was, at £19 to £19 5s. per ton. Caustic soda is fully maintained at from £14 10s. to £16 10s. per ton according to quality, and a fairly good demand is reported. Saltcake is rather quiet but about unchanged on the week at £3 10s. per ton. Bicarbonate of soda has been slow, but values are held at £10 10s. per ton. Although not particularly active, sulphide of soda continues to display a firmer tendency, commercial now ranging from £8 10s. to £8 15s. per ton and 60-65 per cent. concentrated solid at about £11 5s. per ton. Prussiate of soda is also firm at 4½d. to 4¼d. per lb. Bichromate of soda is steady and in moderate request at about 3¼d. per lb.

In the potash section, permanganate meets with a quiet demand, and quotations seem to be somewhat steadier, with B.P. quality offering at about 6d. per lb. and commercial at 4⅞d. Chlorate of potash is in limited request at 3⅜d. per lb. For carbonate of potash inquiry is on a fair scale, and prices are quite steady at round £26 5s. per ton, with caustic potash in a similar position at £29 per ton. Bichromate of potash is receiving some attention, and values are maintained at 4⅛d. per lb. Yellow prussiate of potash is also well held at 7¼d. per lb.

Arsenic values for the time being remain quite firm on scarcity, but the demand is only moderate; white powdered, Cornish makes, is quoted this week at £17 5s. to £17 10s. per ton, at the mines. Sulphate of copper is rather steadier again at about £24 5s. per ton, f.o.b., and a quiet trade continues to be done. Nitrate of lead is still on offer at about £40 per ton, and some inquiry has been reported. White and brown acetate of lead are quiet and about unchanged at £44 to £44 10s. and £41 per ton, respectively. Acetate of lime is slow and easier again at £15 15s. to £16 per ton for grey material, and £8 17s. 6d. for brown.

### Acids and Tar Products

Oxalic acid maintains its firmness, and from 3⅞d. to 4d. per lb. is still being asked; prompt supplies, however, are on the short side. Acetic acid meets with a fairly active demand at steady prices, 80 per cent. commercial quality being quoted at round £37 per ton, and glacial at £66 to £67. In the case of citric acid, buying interest is limited, although at about 1s. 2¾d. per lb. there has been little change in price levels. Tartaric acid is on offer at 11¼d. to 11½d. per lb., and meets with a moderate demand.

Pitch has not been altered much since last week, current f.o.b. prices being about £5 12s. 6d. per ton, although there is still not much actual business being done. Solvent naphtha is quiet and perhaps a shade easier at 1s. 7¾d. to 1s. 8d. per gallon. Carbolic acid crystals are in fair request at about 6¼d. per lb. Creosote oil is still rather featureless, with quotations at round 7¾d. per gallon.

# Sir Alfred Mond at Widnes

Sir Alfred Mond addressed a large audience at a meeting held at the Borough Hall, Widnes, on Friday, February 4, on international politics and local industry. He was supported by Dr. G. C. Clayton and Captain F. W. Bain. The chairman, Mr. J. W. White, gave a descriptive account of Sir Alfred Mond's career. Sir Alfred paid a tribute to Dr. Clayton, with whom he had sat in the House of Commons on opposite sides, but he was glad to say that they were on the same side now. There was only one opinion in the House about Dr. Clayton, and that was that everybody loved and respected him. He said that the constituency were very lucky to have such a member.

Speaking as the chairman of the I.C.I., he said he was told that many of those at the meeting were engaged in the same industry in which he had spent his life. In forming the merger, they had thought of the greatest interests of the industry, the greatest interests of the nation, and the greatest interests of the Empire. That was behind the minds of the heads of the four concerns in the merger. They were prosperous businesses which could continue on their own, but their industry was symptomatic of others. They were faced with great combinations in Germany and America, and powerful as their four concerns were individually, they were small by comparison with the great combines in the other countries. They thought it was vital to the chemical industry of the country and the Empire to be able to operate with equal strength, equal unity, and equal finances with their great competitors in other countries. Sir Alfred went on to describe the changes in the industry. A question was asked after the speech by one of the audience, if the chemical combine would reduce its staff or not, as a result of the reorganisation. Sir Alfred said it was quite impossible to answer that question yet, but he hoped that the developments would be such that they should require more staff and not less.

Dr. Clayton said he came to the meeting with a large number of thoughts, but he was pleased to think that Sir Alfred Mond had the same thoughts and that he had expressed them very much better than he could have done. Dr. Clayton said he was particularly pleased to hear what Sir Alfred had to say concerning the objects of the large chemical combine. He said that during the last few years, chemical processes had been almost completely altered, but the interesting thing was that their skilled workmen had turned from one to the other in a most marvellous way, and showed most extraordinary adaptability. There were men in Widnes capable of taking up any industry.

### Possible Reversion to Free Nitrate Sales

The current fortnightly circular on the nitrate of soda market issued by Aikman (London), Ltd., states that two German producers with quotas of about 4,500,000 metric quintals, and the Anglo-Chilean Nitrate Corporation, which, including its new oficina, is understood to have been offered a quota of about 4,250,000 metric quintals, have given notice to the Producers' Association of their intention to withdraw from the present system of controlled selling at June 30, 1927. Commenting on this development, Messrs. Aikman observe that as on the basis of the above-mentioned quotas the combined production of the producers concerned represents about 16 per cent. of the Associated Producers, the withdrawal of another 4 per cent. of the associates would make free selling practically certain.

### Chemical Scheme that did not Fructify

In the bankruptcy of Dudley Wright, 31, St. Mary Axe, London, E.C., who had been interested in a scheme for the production in this country of certain chemicals formerly manufactured in Germany, and also in a low-pressure oil burner, the Official Receiver has now issued to the creditors a summary of the statement of affairs, which discloses liabilities £7,309, of which £3,157 are returned as expected to rank, and an estimated surplus in assets of £1,870. In his observations, the Official Receiver states that the bankrupt does not admit insolvency. He attributes his present position to his failure to recover a sum of £3,000 alleged to be owing him, and to the failure of his "chemical" scheme to fructify.

# Company News

BORAX CONSOLIDATED, LTD.—The directors recommend a final dividend of 1s. 3d. per share (6¼%), less tax at 4s. in the £ on the deferred ordy. shs., making 10% for the yr. ending Sept. 30, 1926, as compared with 12½% for each of the two preceding years.

HORACE CORY AND CO.—For the year 1926, the net profits, after placing £1,000 to reserve, were £10,491 and £3,419 was brought forward. A final dividend of 5 per cent. is proposed on the ordinary shares, making 9 per cent. for the twelve months, and the sum of £2,160 is to be carried forward.

JOHN KNIGHT, LTD.—The profits during the year to November last were £148,509, to which was added £78,155 brought forward. The directors propose to reduce the dividend on the ordinary shares from 30 per cent. to 15 per cent., but to place £10,000 to reserve, the last allocation to which was £30,000 in 1919.

UNITED ALKALI CO., LTD.—The directors recommend a final dividend on the ordinary shares of 10 per cent., less tax, for the year 1926. Owing to the coal stoppage, no interim was paid on the ordinary shares during the year, so that the present proposal of 10 per cent. covers the whole twelve months. For 1925 the final was 6 per cent., also making 10 per cent. for the year, against a total of 12½ per cent. for 1924.

## Tariff Changes

BRITISH INDIA.—Customs Ruling No. 14 of 1926 of the Central Board of Revenue states that steel electrodes covered with a flux or other material are assessable at 15 per cent. *ad valorem*. Bone electrodes, however, which are imported either in coils or in cut lengths, are, when made of steel of special composition, assessable as alloy steel, otherwise as wire or rod according to diameter.

FIJI.—An Ordinance (No. 19 of 1926), assented to by the Governor of Fiji on November 30, 1926, and entitled the Drugs and Poisons Ordinance, 1926, provides for the control in the Colony of the sale of drugs and poisons and for the manufacture, import and export of raw and prepared opium and various other drugs and preparations of a similar nature. Schedule C to the Ordinance contains a list, which may be added to at the discretion of the Governor, of certain simple medicines and household substances, such as Epsom and Glauber salts, castor oil, washing soda, and certain proprietary milk food products.

BELGIUM.—The *Moniteur Belge* for January 22 contains a Decree, dated January 14 and effective as from January 24, which modifies certain items of the Belgium Customs Tariff, oils of petroleum, schist, lignite, and other similar mineral oils, alcoholic preparations not specified or included elsewhere in the Tariff containing ethyl alcohol and refined borax (borate of soda).

TUNIS.—The *Journal Officiel Tunisien* for December 31 contains a Decree, dated December 28, and is effective as from January 1, fixing the export duties on certain goods, on sea salt, mined salt, and rock salt.

### Australian Commonwealth Carbide Company

THE subscription list was opened this week for 180,000 8 per cent. participating preferred ordinary shares of £1 and 180,000 deferred shares of 1s. in the Australian Commonwealth Carbide Co., Ltd. The company has been formed to acquire from the Tasmanian Government, as a going concern, the fully-equipped works situated at Electrona, about 20 miles from Hobart, in Tasmania, together with the limestone quarries and a valuable power concession, and to carry on and develop the business of manufacturing carbide and carbide by-products at the works on the lines adopted successfully by the Government during the year 1926. These are the only carbide works in the Commonwealth. A former company established the works at Electrona, but expended its resources mainly in the treatment of complex ores and other experimental work. The Government, who had previously loaned the company money, entered into possession in April, 1926, and appointed prominent Tasmanian business men as an advisory committee to reorganise the works with a view to carrying on the manufacture of carbide and by-products.

# New Chemical Trade Marks

### Applications for Registration

***This list has been specially compiled for us by Mr. H. T. P. Gee, Patent and Trade Mark Agent, Staple House, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained, and to whom we have arranged to refer any inquiries relating to Patents, Trade Marks and Designs.***

*Opposition to the Registration of the following Trade Marks can be lodged up to February 9, 1927.*

"BECSPRAY."

475,652. Class 4. A coal tar mixture, for use in spraying roads. The Gas Light and Coke Co., 84, Horseferry Road, London, S.W.1; manufacturers. December 8, 1926. (To be Associated. Sect. 24.)

"BECGROUT."

475,653. A coal tar mixture, for use in grouting roads. Class 4. For particulars see above.

"IGETECTOL."

475,946. Raw or partly prepared vegetable, animal and mineral substances used in manufactures, not included in other classes. Class 4. I. G. Farbenindustrie Aktien Gesellschaft (a joint stock company organised under the laws of Germany), Mainzer Landstrasse 28, Frankfort-on-Main, Germany; manufacturers. December 15, 1926.

## Chemical Trade Inquiries

***The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.***

TENDERS ARE INVITED for the supply under contract during the period ending March 31, 1928, of sulphuric acid (B.O.V.), nitrite of soda, copperas green, disinfectants, etc. Particulars may be obtained at the office of Mr. E. Bleakley, Town Hall, Sale.

CHEMICAL MANURE, BAGS, SACKS, ETC.—The Egyptian Ministry of Agriculture are inviting tenders for the supply of the following goods required during 1927–28: Nitrate of soda, nitrate of lime, sulphate of ammonia, superphosphate of lime, new bags for bagging the nitrate of soda, new sacks for sacking cotton seed (Tagawi), etc. Tenders will be received by the Ministry of Agriculture, Sharia Dar el Niaba, Cairo, up to March 21, 1927. In the case of certain quantities of nitrate of soda required, the latest date for the receipt of tenders is June 7, 1927. Local representation is essential. (Reference No. C.X. 2196.)

DRUGGISTS' SPECIALITIES, ETC.—A firm of manufacturers' agents in Montreal, with warehouse facilities, who only sell to the wholesale trade and the department stores throughout Canada, desire to take up additional agencies of British manufacturers only. (Reference No. 129.)

## Coal Hydrogenation

IN a paper read at a meeting of the Cleveland Institute of Engineers on Monday, Mr. J. A. Roelofsen referred to the interest which had been aroused by Dr. Bergius's work in connection with the hydrogenation of coal or lignite. He mentioned that several Governments and large industrial concerns in various countries had subscribed part of the capital for carrying on the experimental work and had thereby reserved certain rights for the eventual exploitation of the process. The British Government and several firms on Tees-side and the North-East Coast were among these. It had been his good fortune to visit and examine this experimental plant, and he fully agreed with those who had visited these works, that they constituted a brilliant example of the combined intelligence and ingenuity of the chemist and engineer.

THE BRITISH EMPIRE SECTION of the Leipzig International Industries Fair, which will be held on March 6 to 12, is rapidly being booked. The British offices of the fair are at 1, Gower Street, London, W.C.1, and 166, Buchanan Street, Glasgow, C.1.

# Commercial Intelligence

*The following are taken from printed reports, but we cannot be responsible for any errors that may occur.*

## County Court Judgment

*[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]*

MOODY, Francis James (trading as WEST LONDON FABRIC DYERS), Dandysford Cottage, Totteridge Lane, Whetstone. (C.C., 12/2/27.) £59 15s. 10d. November 30.

## Receivership

SHEPHERD (M.) AND SONS (GLACERIES), LTD. (R., 12/2/27.) G. E. Bevan, C.A., of Imperial Chambers, 12, Caer Street, Swansea, was appointed receiver and manager on January 22, 1927, under powers contained in debenture dated January 23, 1925.

## Mortgages and Charges

*[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]*

LANCEGAYE AND CO., LTD., Mitcham, paint manufacturers. (M., 12/2/27.) Registered January 27, £610 debenture to A. Farr, 12, Gloucester Square, W.; general charge. *£701. January 5, 1927.

### Satisfactions

BURTON (W.) AND SONS, LTD., Leicester, bleachers, etc. (M.S., 12/2/27.) Satisfaction registered February 1, £8,000; registered November 22, 1921.

NAYLOR BROTHERS (LONDON), LTD., Slough, varnish manufacturers. (M.S., 12/2/27.) Satisfactions registered January 27, all moneys, etc., registered June 17, 1920, and February 3, 1921.

## London Gazette, &c.

### Notice of Intended Dividend

PAYNE, Ernest Edward Munro (described in the Receiving Order as Edward Ernest Munro Payne), "Redhouse," Narborough, Leicester, analytical chemist. Last day for receiving proofs, February 19. Trustee, E. Barlow, Official Receiver, 1, Berridge Street, Leicester.

### Partnership Dissolved

LUNT BROTHERS (John Harold LUNT and James Peter LUNT), paint manufacturers, 141, County Road, and elsewhere, Liverpool, by mutual consent as from January 31, 1927. Debts received or paid by J. P. Lunt, who continues the business.

## New Companies Registered

BOOTS THE CHEMISTS (INDIA), LTD., 37, Station Street, Nottingham. Registered as a "private" company on February 4. Nom. capital, £1,000 in £1 shares. Wholesale, retail, pharmaceutical and dispensing chemists and druggists, manufacturers of and dealers in chemicals, medical and chemical preparations, etc.

CLEVELAND PETROLEUM PRODUCTS COMPANY, LTD.—Public company. Registered February 1. Nom. capital, £500 in 400 ordinary shares of 5s. each and 400 10 per cent. cumulative participating preference shares of £1 each. Buyers, sellers, manufacturers, distillers and refiners of and dealers in petroleum, crude and refined oils, etc., sulphate of ammonia, etc. Office: St. John's House, 124/7, Minories, London, E.C.3.

INTERNATIONAL RESEARCH AND DEVELOPMENT CORPORATION, LTD., 17, Shepherd's Bush Green, London, W.12. Private company, registered February 5. Nom. capital, £100 in 1s. shares. Analytical and manufacturing chemists, wholesale druggists, etc. Directors: C. J. Hedley-Thornton, 17, Shepherd's Bush Green, London, W.12, and L. A. Blackburn.

### Engineers' Club

AT the fifth annual general meeting of the Engineers' Club, at the club premises, Coventry Street, London, the president (Sir Joseph W. Isherwood), in reviewing the progress during 1926, pointed out how, in spite of the extreme difficulty of the period and the depression which had affected the engineering industries, the results exhibited a very substantial support, and proved that the club itself was a recognised centre of engineering life, and was a well-needed rendezvous of both the professional and the commercial engineer. The report and accounts were received and approved.

Sir J. Fortescue Flannery was unanimously elected President for the year 1927, and in acknowledging his election, expressed his appreciation of the honour, and stated his determination to follow his predecessors, Sir Edward Manville, Sir Robert Hadfield, and Sir Joseph Isherwood, in sustaining the high reputation which the club had achieved.

Messrs. Vizard, Oldham, Crowder, and Cash were re-elected honorary solicitors, and Messrs. Chantrey, Button and Co. were reappointed auditors. A hearty vote of thanks to Sir Joseph W. Isherwood for his services as president during the last three years was carried.

### Oxford and Shipton Cement, Ltd.

THE subscription list of this company was opened on Monday, subscriptions being invited for 400,000 ordinary £1 shares. The company has been formed to acquire the undertaking of the Oxford Portland Cement Co., Ltd., of Kirtlington, Oxfordshire, and to carry on the business of cement manufacturers. The directors include Sir John Brunner and Mr. Henry Mond, both of I.C.I. The consulting engineers are Maxted and Knott, Ltd., and the consulting chemists Woodcock and Melleish. The total share capital is to be £500,000, there being a loan capital of £100,000 as a first mortgage debenture, which the Government has guaranteed under the Trades Facilities Acts. The above issue was over-subscribed.

### Revival of the Welsh Lead Industry

LESS than seventy years ago the United Kingdom produced about one-quarter of the world's total output of lead, and although the deposits are still known to exist, the industry has declined considerably. To revive the former importance of the industry, the Eagle Lead Co. has been formed and an interest taken in three mines in the county of Carnarvon. Failure to take advantage of modern mining conditions, together with faulty developments, brought the working of the mines to a standstill, but with better machinery and technical advice the position is expected to be different.

### Benn Brothers' Other Journals

THE CABINET MAKER.—Exhibitions and Furnishing Week; The Inside of a Mattress, Article XXVII; Wire for Mattress Construction; Fulham's Civic Week.

THE ELECTRICIAN.—"The Use of Complex Numbers in Electrical Engineering," by G. Windred; "Alternating Current Measuring Instruments," by Lieut.-Col. K. Edgcumbe and F. E. J. Ockenden; Edison: The Man and His Work; Proposed Faraday Memorial Library.

THE FRUIT GROWER.—"Training and Pruning Fruit Trees," by H. Goude; The Next Imperial Fruit Show; Stocks for Pears.

GARDENING ILLUSTRATED.—Through the Garden: The Comfort and Convenience of good Garden Walks; "Where Snowdrops Thrive!: The Pitcher Plants," by E. R. Ashton; Recently Planted Fruit Trees; Sweet Peas from a Spring Sowing.

THE GAS WORLD.—"Thoughts on Gas Distribution," by Walter Hole; The Gas Light and Coke Co., Ltd.; Measurement of Gas.

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